Arab Republic of Egypt
Ministry of Environment

EGYPTIAN BIODIVERSITY
STRATEGY AND ACTION PLAN
(2015 - 2030)

EGYPTIAN BIODIVERSITY STRATEGY AND ACTION PLAN (2015 – 2030)

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CREDIT

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Foreword

Egypt has a unique biodiversity that contributes to its economy and supports human wellbeing and provides regulating and supporting services. Egypt, as a Party to the CBD, has revised its National Biodiversity and Action Plan (NBSAP) (2015-2030) in line with the new CBD Strategic Plan for Biodiversity 2011–2020, through wide participatory process. Following an initial stocktaking and appraisal of the status of national biodiversity and the underlying causes of biodiversity loss, six strategic goals identified to address the decline in biodiversity and achieving the Aichi Targets.

In this context, I am pleased to present the first update of the National Biodiversity Strategy and Action Plan (2015-2030) as the first NBSAP was (1998-2017). This work is a sincere work conducted by national team of biodiversity specialists.

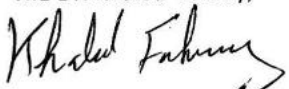
Since the first strategy, the world witnessed such changing environment that led to rapid change in safeguard and conservation guidelines. This urged to the adoption of a new strategy by CBD in Aichi 2010 based on biodiversity mainstreaming in government sectors as well as to prevent deterioration of biodiversity and ecosystem functions and goods.

The emerging issues includes but not limited to considering the biodiversity as natural assets and capital to maintain, preserve and sustainably use. Having mentioned so, the aquatic and terrestrial ecosystem occupied the 14th and 15th goal of the Global Sustainable goals adopted by UN. Protected areas have been Egypt's most essential and effective tool to conserve its biodiversity, preventing the potential loss of species and habitats, as well as fulfilling its international commitments. The biodiversity components and elements of Egypt are of prime importance at the national, regional and global levels but representing the World Heritage sites both natural and cultural. Egypt has an immense array of habitats and micro-climates zones holding extensive biodiversity and local communities. A total of 5 main habitat systems, 12 habitat sub-system and 36 habitat classes were identified and described. Desert habitat, pastureland habitat, mountain habitat, and coastal habitat.

The conservation of biodiversity is of collective responsibility between state and non-state actors with specific emphasis on the community based organizations. The implementation of NBSAP 2030 will be coordinated by EEAA with the full participation and guidance of the cross-sectoral NBSAP 2030 steering committee.

The vision proposed in this national strategy necessitate large multilayer stakeholder participation to ensure the proper management of our natural resources and conservation of ecosystem services and goods for the prosperity of our future generations.

H.E Dr. Khaled Fahmy,



Minster of Environment

ACKNOWLEDGEMENT

The NBSAP would like to take the opportunity to thank all the staff in the Nature Conservation Sector (NCS) for their true support and endless help particularly the protected area staff for providing data and information during the preparation of the strategy and the economic valuations studies of the goods and services provided by natural ecosystems within protected area.

The NBSAP project manager would like to extend his sincere gratitude to all the stake holders participated in all the 19 meetings and workshops to formulate this strategy.

The participatory approach followed during the preparation of this strategy necessitate the participation of wide array of specialist and focused groups and this wasn't achievable without support of the administration authorities represented in different ministries, research institutes, universities and governmental agencies, to all of those we thank their unconditioned and extended support.

Due thanks are extended to the unprecedented attendance of biodiversity specialists and stake holdersduring the launching workshop of the strategy on 28th of January. Their active participation and comments enriched and inspired the event which was reflected on rich inputs to the final version of the strategy.

Special thanks and gratitude are due to UNDP representatives for their endless support and continuous guidance throughout the project span.

List of Appreciations

EEAA	Egyptian Environmental Affairs Agency
CBD	Convention Biological Diversity
COP	Conference of Parties
MALR	Ministry of agriculture and Land Reclamation
MoE	Ministry of Environment
MOL	Ministry of Learning
NBSAP	National Biodiversity Strategy and Action Plan
NCS	Nature Conservation Sector
NLUPC	National Land Use Planning Commission
PAs	Protected Areas
SDGs	Sustainable Development Goals

CONTENTS

SUMMARY 1

I. Introduction 6

II. Background 9

1. Geographical features and location 9
2. Country's biodiversity profile 10
3. Habitats' diversity 13
4. Protected Areas 21
5. Renewable natural biodiversity resources 26
6. able resources 28

III. Conservation of natural biodiversity resources 31

1. Successful models 33
2. Successful stories 42
3. Importance of biodiversity for Egypt 45
4. Socio-economic significance of Biodiversity 46
5. Main threats and drivers of change to biodiversity (direct and indirect) 48
6. Biodiversity-related national commitments and programs 52

IV. National Biodiversity Strategy and Action Plan (2015 – 2030) 56

1. Guiding Principles Goals and 56
2. General Considerations 59
3. Vision and Mission 60
4. National Action Plan 60
5. Matrix of Strategic Goals, National Targets, Themes, Priority Actions and Indicators 62

V. REFERENCES .....

SUMMARY

Egypt has a unique biodiversity that contributes to its economy and supports human wellbeing and provides regulating and supporting services. It is the home of a wide variety of ecosystems and terrestrial and aquatic life forms. Many species of plants, microorganisms and animals in Egypt go back millions of years. At the time being Egypt is in an urgent need to implement several environmental projects in varied disciplines such as protection of Red Sea coastal areas particularly coral reefs and mangroves, combat threats in terrestrial, marine, freshwater and coastal ecosystems, overgrazing and over-fishing, pollution, invasive species, climate change, desertification, wetlands, River systems, coastal and marine environment, conservation of desert biodiversity, preventing land degradation and protecting agro biodiversity

The Convention on Biological Diversity (CBD) that came into force at the end of 1993 requires setting a national biodiversity strategy and action plan (NBSAP) as the primary mechanism for the implementation of the CBD strategic plan to stimulate conservation action at the national level.The National Biodiversity Strategy and Action Plan (1997-2017) were developed by Egypt using a wide participatory approach. The strategy was adopted by the Government in 1998 as response to Egypt's obligations under the Convention on Biological Diversity (CBD).The NBSAP 1998-2017 had 6 main goals and a national action plan composed of 11 programs categorized into enabling and supporting, applied, and research and monitoring projects.

Despite the fact that Egyptian NBSAP (1998 – 2017) did not follow a clear and structured approach for its implementation, many of its objectives and focal areas were addressed, some to a high level of achievement (e.g. those related to PA establishment and management and the NCS / EEAA capacity development). On the other hand objectives concerned with the introduction of biodiversity concerns and priorities into the mainstream of the Egyptian socio-economic landscape were not well addressed, or at least were not widely or systematically addressed. This was reflected on the limited adoption of biodiversity issues in the policies and regulations of most mainstream sectors. Overall, successes had been mainly in short and medium term achievements, with limited impact on policy level processes and root causes (despite multiple efforts), particularly those outside the environmental realm and in the mainstream economic sectors. Moreover, some CBD target areas that were not clearly addressed by the Egyptian NBSAP were nevertheless dealt with in an adequate way (e.g. biosafety and access and benefit sharing issues) by the wide variety of activities and projects that were initiated by the NCS/EEAA and relevant NGOs and funded by Donors Agencies (UNDP, UNEP, EU) and international cooperation (USAID, Italian, Canadian, Swedish, Danish, Japanese, .etc.).

Generally CBD targets that were directly related to the NCS/EEAA and under their direct influence resulted in the greatest degree of achievement and more closely followed the stated objectives. The dominant role of the NCS/EEAA over the NBSAP implementation and the inability to more fully or sustainably engage other stakeholders probably contributed to the limited mainstreaming success of the NBSAP. This is probably partly an outcome of the inherent difficulty of Egyptian Governmental and NGOs alike to form cooperative links across sectoral lines and not a specific issue for the NCS/EEAA. However, this is likely to have been exacerbated by the general low value or importance given to biodiversity in Egypt,

particularly in governmental institutions. The absence of a clear implementation schedule and to some extent the infrequent monitoring and assessment of the NBSAP had also contributed to some degree of ambiguity about the status of the NBSAP amongst potential stakeholders. The inadequate participatory process that governed the NBSAP in the past probably contributed to the loss of the NBSAP value as a national planning document and confirmed its place as an NCS/EEAA plan.

Protected areas have been Egypt's most important and effective tool to conserve its biodiversity, preventing the potential loss of species and habitats, as well as fulfilling its international commitments. By the year 2013, Egypt had established 30 protected areas, covering over 146,000 km^2 or about 14.6 % of the total terrestrial area. However, the coverage did not meet the CBD 2020 Aichi target (Aichi Target 11: "at least 17% of terrestrial and inland water areas and 10% of coastal and marine areas"). Outside protected areas, limited efforts have also been undertaken to rehabilitate some endemic flora and fauna species to increase their numbers in their natural habitats to protect them from extinction. Sustainable agriculture has been gaining more attention lately.

The absence of legal and administrative mechanisms to regulate access to Egypt's genetic resources and to set conditions for benefit-sharing is a key constraint towards achieving a meaningful access and benefit sharing framework. It is hoped that the draft law on the regulation of access to genetic resources and related traditional knowledge and the equitable sharing of benefits from their use that has been finalized will be soon approved by the parliament and Egyptian Government. Relatively few initiatives had been taken to maintain, protect, document and promote traditional knowledge as it relates to natural resource management and on mechanisms to promote access and benefit-sharing of genetic resources.

In 2014, Egypt, as a Party to the CBD, has revised its NBSAP in line with the new CBD Strategic Plan for Biodiversity 2011–2020, through another wide participatory process. After initial stocktaking and appraisal of the current status of national biodiversity and the underlying causes of biodiversity loss, 6 strategic goals were identified to address the decline in biodiversity and achieving the Aichi Targets. In the light of Egypt's commitment to achieve the targets of the Millennium Development Goals (MDGs) by 2015, several national committees were established (sustainable development, integrated management of coastal zones, climate change, wetlands and conservation of biodiversity) to achieve harmonization between policies, strategies and national action plans of development, by executing specific indicators to determine implementation efficiency in different fields, such as environmental sustainability, reduction of poverty pressure, enabling women, improving the quality of health and education.

NBSAP Vision is "By *2030 biodiversity in Egypt is valued, mainstreamed, maintained for the good livelihoods and conserved for the sustainable use of future generations*".

The NBSAP Mission is *"Egypt takes effective and innovative actions to reduce the loss of biodiversity to ensure that by 2030 ecosystems continue to provide their services to all Egyptian and also ensure pressures on biodiversity are reduced; biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; biodiversity issues and values mainstreamed and appropriate policies are effectively implemented in a participatory approach.*"

This vision and mission leads to formulate the Strategic Goals and Targets of NBSAP 2030 to be as follows:

Strategic Goal 1: Conserve and manage terrestrial and aquatic biodiversity to ensure sustainable use and equitable benefits to the people

- T1: By 2030, PAs network secured and expanded to cover 17% of total terrestrial and inland water and at least 5% of coastal and marine representative areas, especially priority sites of particular importance for biodiversity and key ecological Processes, and Effective management of PAs
- T2: By, 2020 develop and implement unified Egyptian methodology for the identification and monitoring of priority of all components of biodiversity according to the international standards to ensure the maintenance or rehabilitation of 50% of our most threatened species focusing on mammals and reptiles to a favorable conservation status
- T3: By 2030, National conservation and/ / or rehabilitation programsof the largest part ofthreatened species and endemic species at risk are developed and implemented with measurestoevaluate its implementation
- T4: By 2020, all IAS and pathways are identified andprioritized with measures in place to update and verify these pathways, in addition to development of national programs to control and manage IAS.

Strategic Goal 2: Sustainable use of natural resources:

- T5: By 2020, Conservation of natural resources through the adoption of ecologically sustainable agricultural management practices, including control of fertilizers and pesticides.
- T6: By 2018, apply CBD tools to monitor and control the impact of tourism on biodiversity, in particular in protected areas and vulnerable ecosystems.
- T7: By 2020, measures, including waste management plans and law enforcement, are in place to prevent and reduce the impact of pollution and waste on ecosystems, especially on wetlands and coastal and marine areas.
- T8 a: By 2025, negative effects of different sectoral policies (land-use planning, transport, energy, uncontrolled urbanization, etc.) on priority elements of biodiversity are minimized, and measures to correct these effects are applied through developing and implementing land use management plans.
- T8 b: By 2021 rate of wetland loss is reduced by 50%, water efficiency in farming is improved by 50%, and BMP in development of inland water ecosystems are available to policy makers.

  T9: By 2027, promote the implementation of good fishing practices in both Mediterranean Sea and Red Sea, favorable to fish protection and their habitats.

Strategic Goal 3: Access to genetic resources and Benefit sharing (Nagoya protocol, indigenous knowledge and traditions)

- T10: By 2020, Effective operational biosafety and ABS mechanism (measures and legislation) in place, in accordance with national laws and relevant international obligations and serving national priorities relating to biodiversity.

- T11: By 2020, to promote sustainable hunting and harvesting through adequate planning, restoration and protection of key biological resources.

Strategic Goal 4: Improve our understanding of biological diversity and ecosystem functioning in a changing environment

- T12: By 2020, the knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied
- T13: By 2030, Research and implement measures and strategies to strengthen local-level biodiversity resilience.
- T14: By 2020, enhancing environmental awareness of Egyptians of the importance of biodiversity and ecosystem services through integrating environmental themes into university and school curricula, promoting green media, and supporting youth clubs and eco-industry.

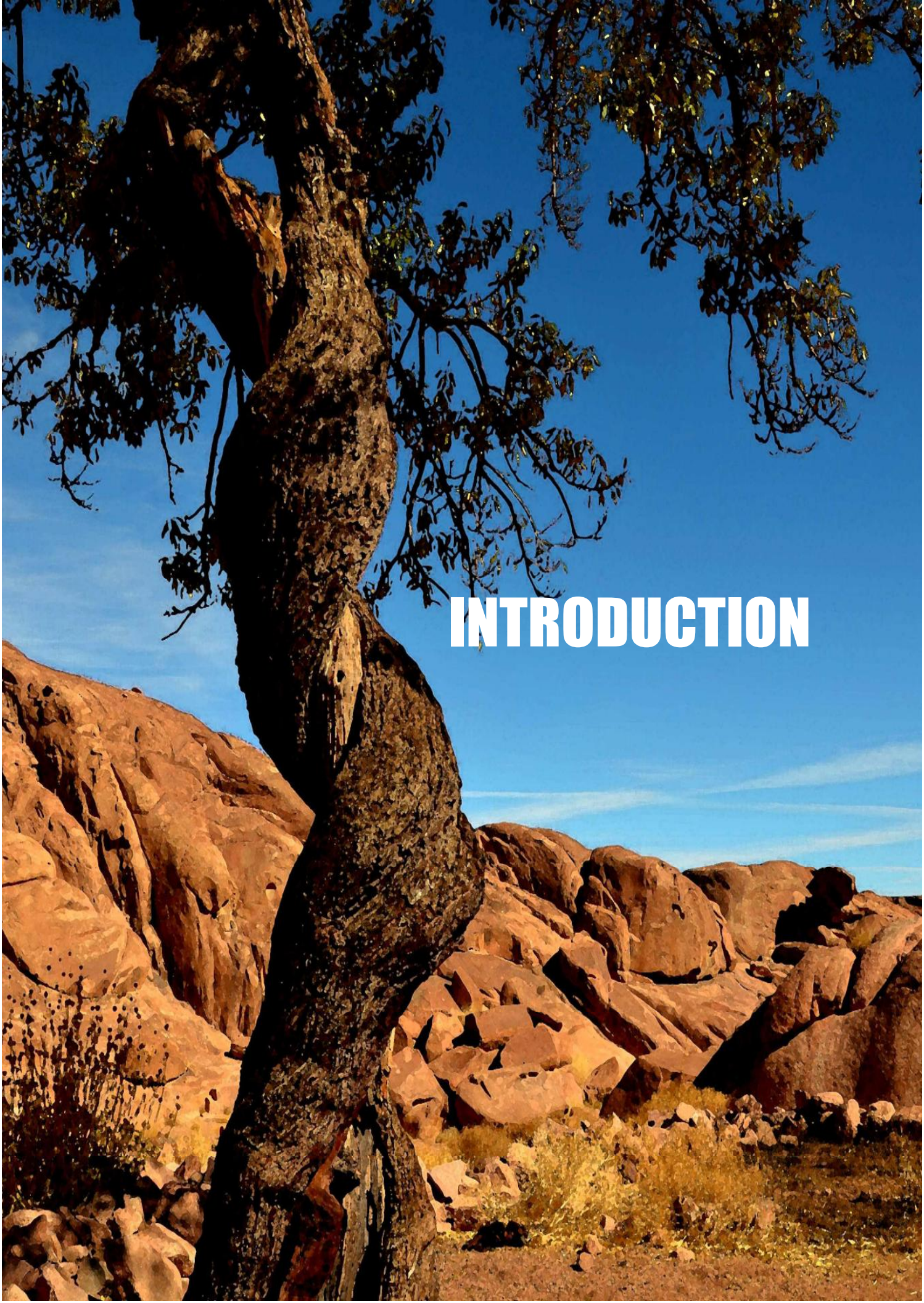
Strategic Goal 5: Prepare for climate change and combat desertification:

- T15: By 2020, investigate and monitor all the effects of climate change on biodiversity and ecosystem services.

Strategic Goal 6: Build partnerships and integrate biodiversity into all national development frameworks

- T16: By 2018, biodiversity values are promoted and integrated into national planning process and mechanisms to support their incorporation into national accounting and reporting systems to be developed
- T17: By 2018, ensure that the national strategy is supported by effective legislation and institutional frameworks to improve its enforcement
- T18: By 2017, proper NBSAP and associated resource mobilization are in place, in addition to establishment of the national biodiversity committee to ensure periodic evaluation of NBSAP

The implementation of NBSAP 2030 will be coordinated by EEAA with the full participation and guidance of the cross-sectoral NBSAP 2030 steering committee. Independent evaluations of NBSAP 2030 will be undertaken to ensure that the status of biodiversity in Egypt is effectively tracked and so that Egypt's contribution towards the achievement of the CBD Strategic Plan (2011-2020) and the Aichi Targets could be effectively measured.



INTRODUCTION

1. Introduction

Biodiversity, that astonishing array of ecosystems, species and genes bordering us constitutes our livelihoods insurance and represents a natural capital strengthening our sustainable development and economy. The deterioration and loss of biodiversity jeopardize food security, health, clean environment as well as economic development. However, imperative need for more operative conservation and sustainable use, trends from accessible indicators advocate that the state of biodiversity is worsening, the pressures upon it are cumulative, and the benefits coming from biodiversity are diminishing. Despite the many efforts taken around the world to conserve biodiversity and habitats and use them sustainably, retorts so far have not been pleasing to tackle the scale of biodiversity loss or reduce pressures.

In ancient Egypt certain species were sacramental (e.g. thesacred ibis, sacred scarab, etc.) or protected as public property because of theireconomic importance (e.g. papyrus). Not long ago, the Egyptian government issued certain laws to protect biodiversity and natural habitats. For instances, in 1982 the Presidential Decree no. 631 established the Egyptian Environmental Affairs Agency (EEAA) and in 1983 the Parliament enacted the Law no. 102 that empowered the Prime Minster to issue decrees assigning prescribed territories as protected areas and outlining their rulings. Egypt also signed the CBD that was subsequently ratified in 1994, followed many significant events and achievements in the conservation of Egyptian nature. The most important achievement is that the natural protected areas reached 30 with an area of some 149,000 km^2, representing 14.9% of total Egypt's area. These protected areas cover most of the distinguished ecosystems and habitats sheltering more than 2000 species of plants and animals.

The Parties of the CBD met in 2010 at Nagoya, Japan and adopted a Strategic Plan for Biodiversity 2011- 2030 to motivate broad based actions sustaining biodiversity over the next decade by all countries and stakeholders. In recognition of the imperative need for action, the UN General Assembly has also declared 2011- 2030 as the UN Decade for Biodiversity that necessitates effective and urgent actions to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to endow with key services, thereby securing the planet's variety of life, and contributing to human well-being and poverty suppression. To warrant this, pressures on biodiversity will be abridged, ecosystems are restored, biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and

equitable manner; adequate financial resources are provided, capacities are enhanced, biodiversity issues and values are mainstreamed, appropriate policies are effectively implemented, and decision-making is based on sound science and precautionary approaches. Together with those services, are effectively conserved and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, are integrated into wider landscape and seascapes.

The Strategic Plan includes a shared vision, a mission, strategic goals and 20 ambitious, yet achievable targets, collectively known as the Aichi Targets. The Strategic Plan functions as a bendable framework for setting national and regional targets and promotes the coherent and effective implementation of the CBD objectives. The development of national targets, and the updating and revision of national biodiversity strategies and action plans (NBSAPs), will be a key processes in rewarding the commitments set out in the Strategic Plan. By 2030, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.

In 2014, Egypt, as a Party to the CBD, has revised its NBSAP in line with the new CBD Strategic Plan for Biodiversity 2011–2030, through wide participatory process. A 15 member National Biodiversity Committee on behalf of various stakeholders and six working groups, assisted by national and international consultants, working in thematic and cross-cutting areas have been conventional to guide the update of the NBSAP. After initial stocktaking and review of the current status of national biodiversity and the underlying causes of biodiversity loss, 6 strategic goals were renowned to forward the decline in biodiversity and achieving the Aichi Targets. In addition, the NBSAP sets clear national biodiversity targets and priorities and aims for the integration of biodiversity concerns into relevant sectors and contributing towards the attainment the global biodiversity agenda and the Millennium

The leading role of the NCS/EEAA over the NBSAP execution and the inability to more entirely or sustainably fit into place other stakeholders probably contributed to the inadequate mainstreaming success of the NBSAP. This is perhaps partly an upshot of the inherent obscurity of Egyptian Governmental and NGOs alike to form supportive links across sectoral lines and not a specific issue for the NCS/EEAA. However, this is likely to have been exacerbated by the broad-spectrum low value or magnitude given to biodiversity in Egypt, for the most part in governmental institutions.

BACKGROUND

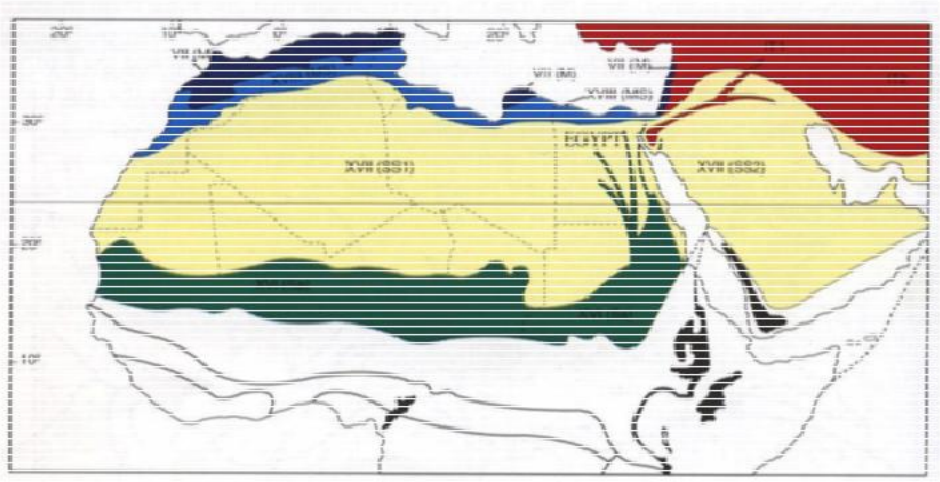
II. Background

1. Geographical features and location

Egypt is uniquely positioned midway between Africa and Asia, with its long coasts of the Mediterranean Sea in the north (c. 970 km) and th Red Sea in the east (c. 1,100 km). The county covers an area of about one million square kilometers and can be divided into four physiographic regions: the Nile Valley and Nile Delta, Western Desert, Eastern Desert, and Sinai. The country can also be divided into 4 bioclimatic zones: the eastern desert, which is hyper arid with mild winters, hot summers and extremely rare rainfall; the southern Sinai region which is also hyper arid but has cool winters, hot summers, and less than 30 mm/year of rainfall; the coastal belt along the Mediterranean Sea; and the sub-coastal belt and the wetlands (Nile Valley, Nile Delta).

The arid desert covers 92% of the country's surface area, with the remaining 8% of arable land being restricted to the Nile Valley, the Nile Delta and a few oases scattered in the Western Desert. Given the country's physiography, Egypt's population is unevenly distributed, where 99% of Egyptians live on less than 4% of the land.

Egypt is the meeting point of biotic elements belonging to four bio-geographical regions: i) the Mediterranean-Sahara regional transition zone (MS-XVIII), which occupies a small area along the Mediterranean coast; ii) the Sahara- Sindian regional zone (SS-XVII), which encompasses the vast desert occupying the greater part of Egypt; iii) the Irano-Turanian regional center of endemism (IT), which occupies a small area in the Sinai highlands and some enclave areas in the Eastern Desert (e.g. Galala Mountains); and iv) the Sahel regional transition zone (Sa-XVI), which comprises the Afrotropical Gebel Elba mountainous region in the southeast of Egypt (Map 1).



0: Phytochoria in North Africa and Southwest Asia

Red Sea and the Nile Basin are two foremost highways along the migratory routes of the Palearctic-tropics journey of birds, and the Mediterranean wetlands of Egypt (northern lakes: Bardaweel, Manzala, Burullus, Idku and Mariut) are vital resting stations. They are internationally notable sites within the framework of the Wetland Convention (Ramsar, 1971) and the Convention on the Conservation of Migratory Animals (Bonn, 1979). The Nile Basin

encompasses the valley in the south (Upper Egypt) and the Delta in the north (Lower Egypt), and forms a riparian oasis (40000 km^2); this is the densely inhabited farmlands of Egypt.

According to the system applied in the UNESCO map of the world distribution of arid regions that takes into consideration the degree of aridity, the mean temperature of the coldest and the hottest months of the year and the time of the rainy period relative to the temperature regime), four major bioclimatic provinces are recognized in Egypt: the hyper arid province that includes the Eastern Desert except the coastal mountains along the Gulf of Suez and the southern parts of the Western Desert, the hyper arid province that includes the mountainous massif of Southern Sinai, the coastal belt falling under the maritime influence of the Mediterranean Sea that extends between Rafah and Sallum and the sub-coastal belt.

2. Country's biodiversity profile

The majority of the data and information exhibited in this report has been abbreviated from Egypt's 5th national report (2014) submitted to the CBD. Despite being consistently arid or semi-arid, Egypt is home to an extensive diversity of terrestrial habitats, fauna, flora and microorganisms due to its very varied eco-zones. Although comparatively Egyptian biodiversity is low in species numbers and with few endemics, it is exceptionally diversified in their composition, and portrayed with a global magnitude.

Egypt has a rich and diverse biota. The country is home to a wide range of habitats with microclimates (e.g. mangroves, coral reefs, mountains, sand dunes, oasis, and wadis) that host many plant and animal species and communities representing both tropical and Mediterranean environments. Some dating back millions of years ago, such as the skeletons of whales in the Western Desert (a Natural World Heritage Site in Wadi Al-Rayan Protected Area), while other sites represent the Stone Age, about 10,000 years ago. Some animal and plant species represent relicts of a once flourishing growth in ancient periods when the environment was less severe. As conditions became decidedly arid, a limited number of these species remained in the natural refugee sites. For example, small populations of gymnospermus trees of *Juniperus phoenicea* still exist in a few hilly sites in N. Sinai (e.g. Gebel El-Maghara, Yelleg, Labni and El-Halal). Similarly, a few individual cheetahs (*Acinonyx jubatus*) can be found in the Qattara Depression of the Western Desert, but they are on the brink of extinction.

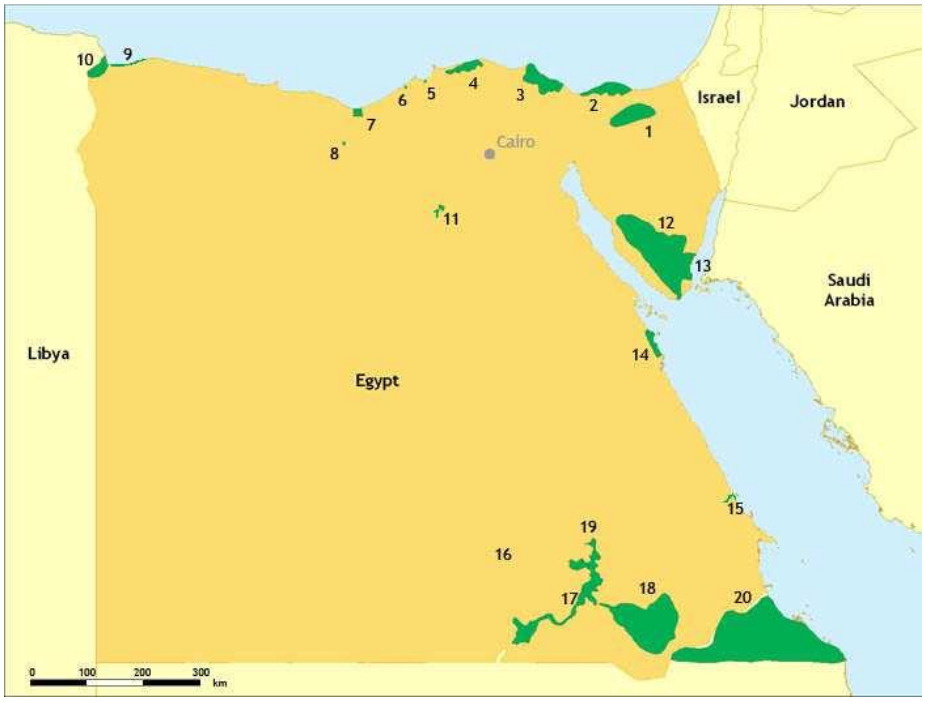
Each of these habitats has its unique fauna and flora and more than 22,000 species of flora and fauna have been identified in Egypt's diverse ecosystems and many more remain to be further investigated. These range from well known-species of plants, mammals, reptiles, amphibians, fish and birds to less visible but equally important aquatic and terrestrial invertebrates, fungi and bacteria. Levels of endemicity are reasonably high as a result of the drying of North Africa over the last 5,000 years, which caused the fragmentation and isolation of fauna and flora, allowing the evolution of many unique forms of life. Isolated pockets of

biodiversity exist in the oases of the Western Desert and on the mountaintops of Sinai. The relatively rich biodiversity of Gebel Elba harbors many endemic forms, however, more research is required to assess their uniqueness relative to other Red Sea fog woodlands further south in the Sudan.

Despite being dominated by desert and drought, Egypt comprises over 2,145 species and 220 infra-specific taxa of native and naturalized vascular plants, in addition to 175 species and subspecies of mosses and 13 of hepatics. The abundance classes of the flora of the different phyto-geographical regions of Egypt and their current status are presented in Table (1). The agro-biodiversity in Egypt contributes 25.3% of the Egyptian flora.

Table (1) Abundance classes of the Egyptian flora (Khedr, 2006)

Region	Very rare	Rare	Common	Very Common	Endemics	Total
Nile Delta	102	167	194	167	2	630
Nile Valley	61	134	49	160	2	504
Fayoum	18	49	109	131	1	307
Oases	63	125	143	163	4	494
Mediterranean West	212	329	298	206	13	1045
Mediterranean East	131	210	225	170	9	736
Eastern Desert North	72	164	147	157	10	540
Eastern Desert South	70	110	81	101	1	362
Isthmic desert	176	225	221	180	15	802
Western Desert	38	77	115	124	3	354
Red Sea Coast	63	105	54	81	2	303
Gebel Elba	199	142	48	54	3	443
Sinai	275	225	159	153	34	812



Map 2: Important Plant Areas (IPAs) in Egypt after (Shaltout & Eid, 2010)

Overall, Egyptian biodiversity comprises 143 types of globally important species, 1500-2000 species of non-flowering plants, 2,302 flowering plants, 111 species of mammals, 480 species of birds, 109 species of reptiles, 9 species of amphibians, and more than 1,000 species of fish. There exist a large number of invertebrates, 10,000 to 15,000 species of insects, more than 200 types of coral species, and 800 species of mollusks and over 1,000 crustaceans. Eighteen indigenous coral species are considered to be world's best as a result of not having been subjected to coral bleaching. Two types of mangroves (*Avicennia marina* and *Rhisphoramucronata*) provide shelter for numerous species (40 species of insects, 72 species of butterflies, 65 mollusks, 17 polychaetes, 22 species of fish). A list of various groups of Egyptian fauna and flora are presented in Table (2)

Table (2) Main Egyptian Biodiversity

Kingdom	Group	English name	species in Egypt	Species Globall	Status		
					R	End	Ex
VIRUS	—	Viruses	44	1000	-	-	-
MONERA	Bacteria	Bacteria	97	3000	-	-	-
	Myxoplasma	Bacteria	60	141	-	-	-
	Cyanobacteria	blue-green algae	162	1700	-	-	3
FUNGI	Zygomycota	Zygomycetes	68	665	-	-	-
	Ascomycota	cup fungi	219	10650	-	-	-
	Basidiomycota	Basidiomycetes	189	16000	-	-	-
	Oomycota	water molds	92	580	-	-	-
	Chytridiomycota	Chytrids	59	575	-	-	-
	Acrasiomycota	cellular slime molds	5	13	-	-	-
	Myxomycota	plasmodial slime	112	500	-	-	-
	Lichen	Lichen forming fungi	9	18000	-	-	-
ALGAE	Chlorophyta	green algae	415	7000	-	-	3
	Euglenophyta	Euglenoids	39	800		-	4
	Pyrrhophyta	dinoflagellates, etc.	295	1100	-	-	1
	Chrysophyta	diatomes,etc.	544	12500	-	-	3
	Phaeophyta	brown algae	48	1500	-	-	-
	Rhodophyta	red algae	142	4000	-	-	1
PLANTS	Bryophyta	mosses, liverworts,	337	16600	-	-	-
	Psifophyta	Psilopsids	0	9	-	-	-
	Lycopodiophyta	Lycopsids	0	1275	-	-	-
	Equisetophyta	horse-tails	1	15	1	-	-
	Pilicophyta	Ferns	16	10000	15	-	-
	Gymnospermae	conifers, etc.	6	529	6	3	-
	Dicotylcdoncae	Dicots	1636	170000	-	86	8
	Monocoty	Monocots	430	50000	-	11	-

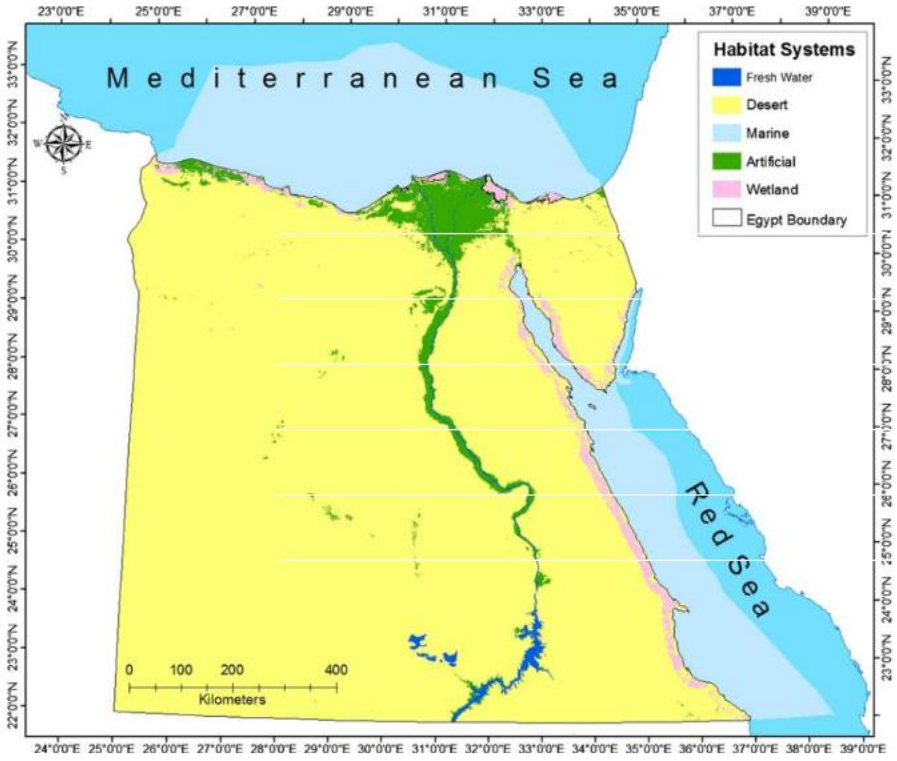
ANIMALIA	Protozoa	protozoa	371	30800	-	-	-
	Porifera	sponges	73	5000	1	-	-
	Cnidaria	jellyfish, corals	389	9000	76	-	-
	Ctenophora	comb jellies	7		-	-	-
	Platyhelminthae	flat worms	7	12200	-	-	-
	Nematoda	round worms	7	12000	-	-	-
	Annelida	earthworms	167	12000	17	-	-
	Mollusca	molluscs	552	50000	-	-	-
	Echinodermata	echinoderms	255	6100	97	-	-
	Arthropoda:	arthropods			-	-	-
	Insecta	insects	10000+	751000	-	-	-
	Arachnida	scorpions, spiders,	1528	109000	-	.	-
	Crustacea	crustaceans	379	9300	-	-	-
	Chordata:	chordates			-	-	-
	Tunicata	tunicates	115	1250	-	-	-
	Chephalochordata	acorn worms	7	23	-	-	-
	Vertebrata:	vertebrates			-	-	-
	Agnatha	jaw]ess fish	1	63	-	-	-
	Chondrichthyes	cartilaginous fish	95	843	35	-	1
	Osteichthyes	bony fish	659	18150	35	-	1
	Amphibia	amphibians	7	4184	-	-	-
	Reptilia	reptiles	91	6300	-	-	-
	Aves	birds	515	9040	113	17	1
	Mammalia	mammals	132	4000	28	10	5

R: rare; End: endemic; Ex.: extinct& ?: The group has not yet been studied.

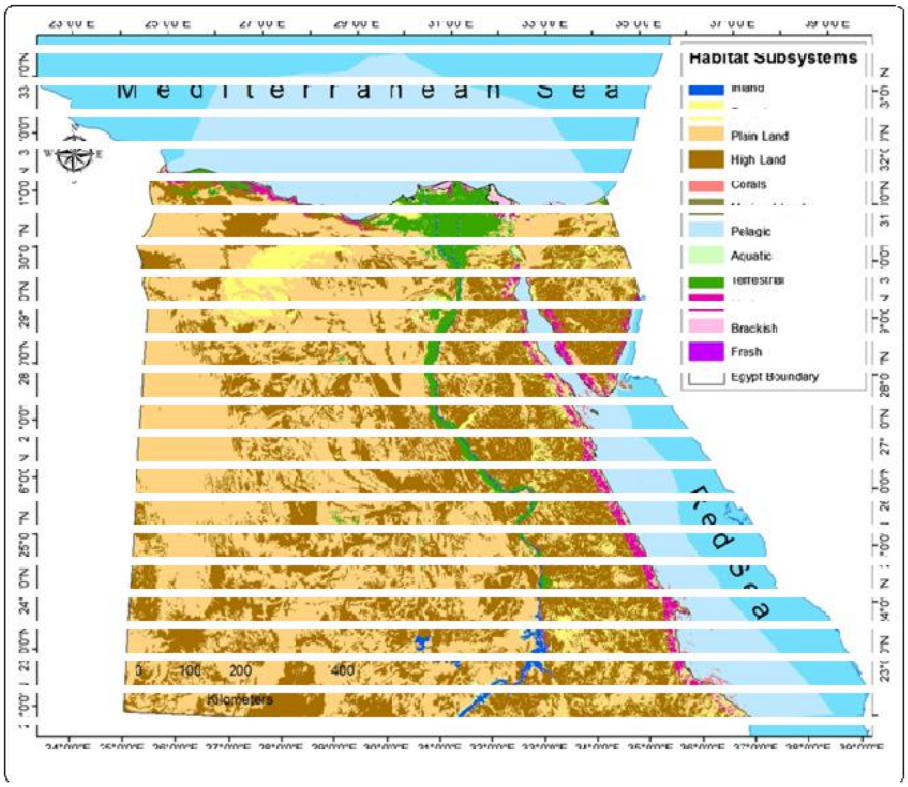
3. Habitats' diversity

Egypt has an immense array of habitats and micro-climates zones holding extensive biodiversity and local communities. A total of 5 main habitat systems, 12 habitat sub-system and 36 habitat classes were identified and described. Detailed analysis of the input GIS layer indi- cated that 4 habitat classes were described but not mapped because of their occurrences were too small to be mapped (Seasonal/Intermittent Freshwater Marshes/ Pools – Oasis and springs – caves and karst – tidepole) at the 90 m spatial resolution used in this work.

This hierarchy represents a new standardized habitats scheming for Egypt. The 36 habitats mapped through this process represent 22 % of the total number of ecosystems (163) described for Africa in 2013 (Sayer *et al.* 2013). To convey a sense of the types, numbers, and distributions of habitats at the national context, Map 3 presents a map of the 5 main habitat systems, while Map 4 presents a map of the 12 habitat sub-systems and Map 5 presents a map of the 36 habitat classes (Harhash *et al.*, 2015).

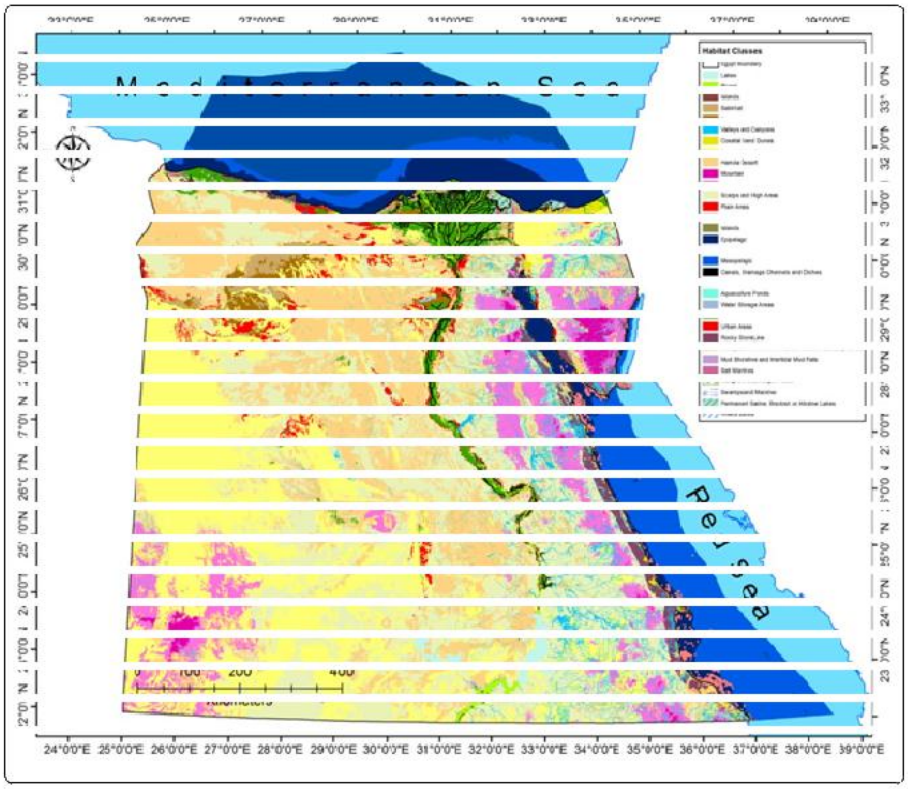


Map 3: Habitat Sytems along Egypt (source Harhash *et al.*, 2015)



Map 4: Habitat main Sub-sytems along Egypt (source Harhash *et al.*, 2015)

BACKGROUND



Map 5: Habitat Sub-sytems along Egypt (source Harhash *et al.*, 2015)

The Desert habitat system represents the dominant habitat system in Egypt where it covers 868860.71 km^2 which represent 86.89 % of the total area of Egypt while the Fresh Water habitat system is considered the smallest habitat system in Egypt where it covers 7156.31 km^2 which represent 0.72 % of the total area of Egypt. The main 5 habitat systems in Egypt can be described in a decreasing order as follows: (1) Desert habitat system (868860.71 km^2 and 86.89 %); (2) Marine habitat system (269204.63 km^2); (3) Wetlands habitat system (70177.49 km^2 and 7.02 %); (4) Artificial habitat system (51938.97 km^2 and 5.19 %); and (5) Fresh Water habitat system (7156.31 km^2 and 0.72 %). Regarding the habitat sub-systems, the Plain Land habitat sub-system represents the dominant habitat sub-system in Egypt where it covers 480719.43 km^2 which represent 48.07 % of the total area of Egypt while the Islands habitat sub-system is considered the smallest habitat sub-system in Egypt where it covers 637.16 km^2. The main 12 habitat sub-systems in Egypt can be described in a decreasing order as follows: (1) Plain Land habitat sub-system (480719.43 km^2 and 48.07 %); (2) High Land habitat sub-system (333192.72 km^2 and 33.32 %); (3) Pelagic habitat sub-system (265154.63 km^2); (4) Marine habitat sub-system (61778.11 km^2 and 6.18 %); (5) Low Land habitat sub-system (54948.56 km^2 and 5.49 %); (6) Terrestrial habitat sub-system (41970.49 km^2 and 4.2 %); (7) Aquatic habitat sub-system (9968.48 km^2 and 1.0 %); (8) Inland habitat sub-system (7156.31 km^2 and 0.72 %); (9) Fresh habitat sub-system (4397.81 km^2 and 0.44 %); (10) Brackish habitat sub-system (4001.57 km^2 and 0.40 %); (11) Corals habitat sub-system (3412.84 km^2); and (12) Islands habitat sub-system (637.16 km^2). Regarding the 36 habitat classes, the Desert Sand Dunes, Sand Sheets and Sand Mounds habitat class represents the dominant habitat class (where it covers 254579.23 km^2 which represent 25.46 %) while the Mangrove Submerged Roots habitat class is considered the smallest habitat class (where it covers 2.44 km^2 which represent 0.001 %) of the total area of Egypt (Harhash *et al.*, 2015).

Wetlands Habitats: Wetlands have an imperious bio-ecological function through maintaining everlasting fit place for distinctive groups of biodiversity, especially migratory water birds. The six Egyptian Mediterranean brackish water coast wetlands or lagoons are sited along Nile delta coast (Manzala, Borollus, Edku and Maruitt) and to the east of the Suez Canal (Port-Fouad and Bardawil). All of them, with the exception of Lake Maruit, are directly connected to sea.

The aquatic fauna of the Northern Delta lakes is a mix of freshwater and marine species. The freshwater fauna is dominated by tilapia species which make the majority of catch. Many Nile species also inhabit these lakes such as; *Hydrocynus forskalii, Lates niloticus, Cyprinus carpio, Barbus bynni, Clarias lazara, C. gariepinus, Bagrus bayad, Lates niloticus.* Several marine species tolerant of freshwater are also found in the Delta lakes, including mullets, soles, seabream, seabass, meager, eels and shrimp.

Lake Burulus is a substantial coastal wetland and Ramsar site on the northern coast of Egypt. Despite the status of Protectorate under Egyptian legislation, the environmental conditions in Lake Burullus witnessed adverse sever changes over the past 40 years. A total of 887 species had been recorded in Lake Burullus, 274 species of vascular plants (137 annuals and 97 perennials), 11 species of aquatic reeds (*Phragmites australis)*, 276 species of phytoplankton (145 of diatoms, 50 species of blue algae, 10 species related to other groups), 90 species of zooplankton, 33 species of benthic animals, 127 species of land invertebrates (screwworms, molluscs, arthropods), 33 species of fish (but only 25 were recorded recently), 23 species of reptiles, 112 species of birds, and 18 species of mammals. During 1970's, 33 species of fish were recorded in Lake Burullus but at the beginning of this century 52 species were recorded (most of them were fresh water fish and migratory fish) while 8 species of marine fish disappeared. However, in spite of increasing primary productivity of the lake, the quality of fish (mostly freshwater fish) value had decreased dramatically.

Lake Bardawilis listed as a Ramsar Wetland of International Importance, and its eastern part received national protection in 1985 (Zaranik Protected Area). In Lake Bradawil, a total of 2111 species had been recorded, 203 species of vascular plants (83 annuals and 120 perennials), 241 phytoplankton and 59 zooplankton species), 72 species of invertebrates including field worms, crustacea (shrimps), molluscs and echinoderms, 55 spiders, 202 species of insects, 45 fish species (bream and mullets), 23 species of reptiles, 241 species of birds (more than 50% of recorded species in Egypt) and 21 species of mammals. Newer fishing practices, like bottom trawling, had reduced the sea bass population because fine mesh nets trap both adult and juvenile fishes. The declining sea bass population, combined with increased water salinity had attracted shrimps and crabs, the sea turtles' favorite food and the Lake had become an attractive wintering ground for sea turtles. In October 2012, over 90 sea turtles were found stranded dead in various stages of decomposition on the shores of Lake Bardawil (Fig 1), suggesting that the killing had been going on for several months (Sarant, 2012;Yahia, 2014). Lake Bardawil is one of the less polluted bodies of water in the country, so pollution seems improbable as a major source of mortality. Of the 90 dead turtles found, only 74 could be clearly identified through photographic evidence.

Figure 1: Turtles found dead and in various stages of decomposition on the shores of Lake Bardawil

All three species of sea turtle occurring in the Mediterranean, the loggerhead, the green and the leatherback turtle were endangered due to human activities and as such are protected through international and national legislation. The health and size of a sea turtle population might serve as a useful indicator of the health of the wetlands located at marine and coastal habitats. A rapid field survey was carried out on 2-3 November 2012 to search for dead or injured sea turtles in Lake Bardawil. Results showed that a total 80–100 Dead Sea turtles was documented. With few pollution sources affecting the lake, it does not seem to be a likely cause of mortality. Death due to litter ingestion cannot be excluded, but it is unlikely to be the main cause of multiple or ongoing stranding.

At Wadi El-Rayan area, two successive lakes, separated by a waterfall, were created as a reservoir for agricultural drainage water. These lakes currently exceed the capacity of Lake Qarun. It is argued that the rapid change in salinity of Lake Qarun excludes the presence of endemic species in its fauna. Flora of Wadi El Rayan Protected Area was monitored (areas of water springs and Rayan lakes) and did not exhibit any significant changes in the status of species as 56 species of flora were monitored. Aqua culture ponds predominantly built in the fringes of the Lake at the account of shore line vegetation (marsh vegetation and reed) and non irrigated agricultural lands increased from nearly 11.000 hectares in 1978 to nearly 17.000 hectares in 2011. Active management (mowing and removal of detritus) had prevented further encroachment of reed and greater loss of open water. The loss of open water, combined with the deteriorating water quality had a damaging impact on the biodiversity (7 valuable fish species disappeared) and the livelihoods of about 50.000 fishermen living around the Lake.

Desert habitats: Arid and semi-arid habitats cover over 90% of Egypt's territory amalgamating disparate environmental ecosystems. The Mediterranean coastal desert receives the highest rain fall in Egypt that covers up to 60 km inland (nearly 200 mm annually) and has a realistic amount of vegetation cover and the greatest national floral biodiversity. Western Desert that occupies about two-thirds of the country's area (681 thousand km^2) is ruthless environment ecosystem for plant growth due to hot summer and extreme daily temperature fluctuation in winter as well as rare rain water. Oases are the most outstanding features of the Western Desert and are the sole source of water and vegetation over much of this desert. A total of 233 species (116 annuals and 103 perennials), belonging to 151 genera and 44 families were recorded in western Mediterranean sand dunes. Some 30 species have unique incidence in these dunes. A total of 219 species (116 annuals and 103 perennials), belonging to 154 genera and 47 families were recorded in Sallum area.

In contrast, the desert bordering Red Sea is very dry and the vegetation is mainstream of that of the Eastern Desert (223 thousand km^2), being for the most part delimited to mouths of larger wades and along the coast where salt marsh vegetation exists. As for Sinai Peninsula (61 thousand km^2) it is well-thought-out to be a gigantic mass of basic formation with high rough peaks (St. Catharine Mountain), valleys and some oases. Wades and mountains are characteristic of the landscape of much of the Eastern Desert and Sinai. About 1775 plant species had been confirmed in desert ecosystems, 279 in North Sinai, 472 in South Sinai, 328 in North Coast, 66 in Halayeb, 250 in Western Desert and 280 in Eastern Desert. Most of recorded plants are coupled to traditional knowledge in Sinai, North Coast, Eastern and Western deserts.

Biodiversity recorded in El-Omayed includes 251 plant species (1 endemic, 11 threatened, 17 endangered of extinction), 324 animal species (39 bird species: 4 endemic, 1 globally endangered, 19 rare; 10 mammals: 1 endemic, 2 endangered of extinction, 4 rare; 33 reptiles: 3 endangered of extinction, 12 under environmental threat; and 242 insect species (2 endangered of extinction). In addition to the presence of some genetic resources such as wild cotton in Siwa.

Wadi Allaqi includes 139 plant species (98 of them became extinct between 2000 and 2006 and 6 species are deteriorating due to over and random grazing), 15 mammal species (including The Barbary sheep (*Ammotragus lervia*), Gazelle, Heyena, sand cat, fox, mountain rabbit, Ibn Awa, and wild donkey) and100 bird species; ostrich species were last seen in 1992.

Biodiversity reported in Siwa includes53 plant species, 28 wild mammals including 8 rare species threatened with extinction (namely cheetah, striped hyena, Egyptian gazelle, white gazelle, red fox, wild cat and Fennec fox), 32 reptile species**,** 164 bird species and36 insects and a large number of invertebrates. In Wadi El Gemal and Hamata 140 plant species

including 32 used in traditional medicine, 24 mammal species, 29 species of reptiles and amphibians and 45 bird species were recorded.

Mountains habitats: Mountainous habitats are mainly found in three places in Egypt, South Sinai, El Owaynat, and, Red Sea and Elba. They cover 0.7 % of Egypt's territory and are exemplified by exclusive biodiversity, predominantly plants because of the variety of habitats individualized with dryness and graduation of temperatures according to the altitude and different habitats such as mountain peaks, rifts, mountain slopes, desert valleys, mountain valleys, and caves.Recent studies proved that high mountains area of St. Catherine's plays an important role in the genetic segregation between valleys that represent the main reason for the diversity of many species of the same family. These act as a normal barrier to the transfer of genes through pollen and seeds that increase isolation of individuals of the same species..The major threats disturbing biodiversity in the mountains are human activities (hunting, logging, trafficking in species, urban development); in addition to alien invasive species, climate change and natural disasters (mainly flooding).

The different taxonomic groups so far recorded in mountain ecosystems are 472 plant species (including 30 endemic ca 50 % of the endemic species in Egypt and 140 medicinal plants), 85 moss taxa (out of 175 taxa recorded in Egypt: 48.8 %), two of them are endemic (*Tortula kneuckeri* Broth & Geh and *Grimmia anodon* Bruch & Schimp. var. *sinaitica* Renauld & Cardot). It contains also one species of hepatics (*Riccia cavernosa* Hoffm.); 41 mammals, 36 reptiles, 50 birds and 33 butterflies in St. Katherine Mountains; 361 plant species in Eastern desert mountains; 458 plant species (3 endemic), 36 mammals, 38 reptiles and amphibians and 60 birds in Elba; 150 plant species in Hamata; 71plant species (40 species became extinct in the last 20 years), 12 mammals, 12 reptiles, 30 birds and 24 invertebrates in El Owaynat and 64 plant species in Gelf Elkebir. Most familiar mountain mammals include Slender horned gazelle, Nubian ibex (*Capra nubiana*), Wild cat (*Felis silvestris),* Swamp cat (*Felis chaus),* Caracal *(Caracal caracal),* Rock hyrax (*Procavia capensis),* hedgehog and ozone vulture.

Agricultural habitats: Agricultural cropland habitats have been diminishing since late 1980s. These declines are thought to be connected to changes in land use and agricultural practices. Agricultural land remains to be lost to human settlements. It is estimated that some 47,700 feddans are lost every year. The introduction and wide use of high yielding varieties led to the neglect and disappearance of traditional varieties and the erosion of crop plant genetic diversity. Currently, Egypt depends on 4 crops (wheat, corn, rice and potato) for 50% of its vegetarian food and 14 mammal and bird species for 90% of animal proteins.

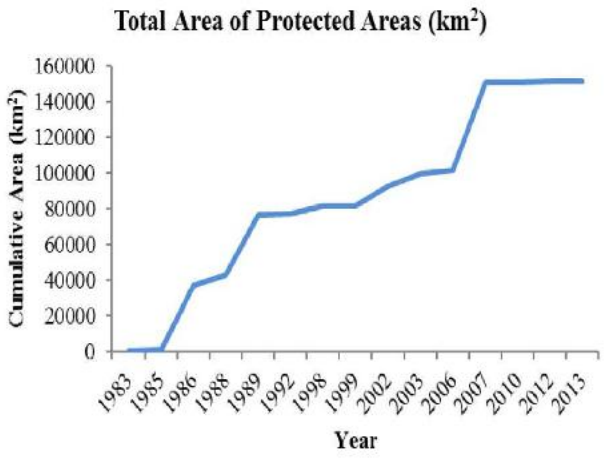
Pasturelands habitats: Pasturelands existing in Elba and Wadi Allaqi in the south and in El-Omighted and Sinai in the north are the most imperative areas of grasslands in Egypt. For example, the local communities located in Elba Mountain, used to stay in aggregates (Madareb) where their houses are located in the vicinity houses of the larger family and the families gather in tribes. The word (Madareb) means areas that inherited from grandparents and parents where boundaries are distinct and recognized. The use of resources within these properties is governed by the Sheikh of the tribe where he sets up rules for the exploitation of wells' water, and cutting trees used in building houses or for fuel.

Marine habitats: Egypt is bounded from the north by the Mediterranean Sea with about 995 km and from the east by the Red Sea with about 1941 km. The Egyptian coastal and marine environment is distinguished by specific habitats, namely coral reefs and mangroves where the greatest known species diversity of any marine ecosystem are found.

Marine environment of both Mediterranean and Red seas is distinguished by many habitats and endangered species especially all marine mammals (17 species), marine turtles (4 species), sharks (more than 20 species) mangrove trees and many birds (white eyed gulls, sooty falcons, ospreys). This is in addition to the great marine biodiversity (more than 5000 species) represented in 800 species of seaweeds, 209 species of coral reefs, more than 800 species of molluscs, 600 species of crustacean, 350 species of Echinodermata, in addition to hundreds of species that have never been revealed until now especially in the Exclusive Economic Zone in the Red Sea and the Mediterranean.

4. Protected Areas

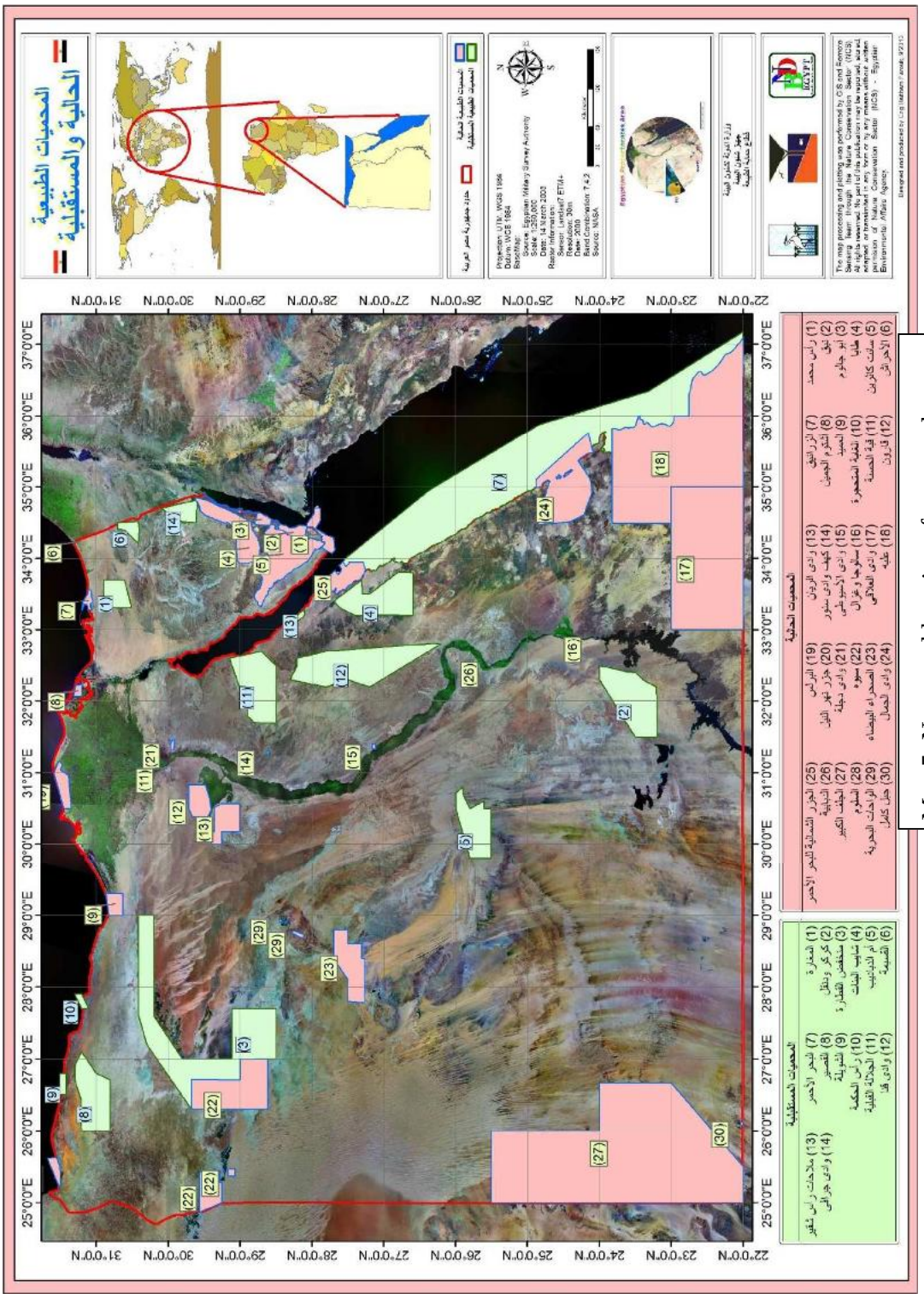
Egypt has declared around 14.9% of its land as PAs, the protected areas provides ecosystems services that contributes to the welfare of Egyptian citizens. Protected Areas have been Egypt's most important and effective tool to conserve its biodiversity, prevent ongoing losses of species and habitats and fulfill its international commitments. They have expanded over the past 30 years in both number and area. By 2013, 30 protected areaswere established, covering over 149,000 km^2 or about 14.9 % of the total land and marine areas of the country. They vary in size, from the largest, El Gelf El Kebeer PA, with about an area of 48,500 km^2 to Saluga and Gazal protectorate with an area of about 0.5 km^2 (Fig 2).



The protected areas declared so far in Egypt cover three main environmental categories wetlands, deserts and special geological formation. Each of these categories embraces a variety of habitat types. Names, location and area of each protected area is illustrated in (Table: 3).

Table 3: Protected area of Egypt

No.	Protected Areas	Declaration Date	Area Km^2	Governorate
1	Ras Mohamed National Park	1983	850	South Sinai
2	Zaranik Protectorate	1985	230	North Sinai
3	Ahrash Protectorate	1985	8	North Sinai
4	El Omayed Protectorate	1986	700	Matrouh
5	Elba National Park	1986	35600	Red Sea
6	Saluga and Ghazal Protectorate	1986	0.5	Aswan
7	St. Katherine National Park	1988	4250	South Sinai
8	Ashtum El Gamil Protectorate	1988	180	Port Said
9	Lake Qarun Protectorate	1989	250	El Fayoum
10	Wadi El Rayan Protectorate	1989	1225	El Fayoum
11	Wadi Alaqi Protectorate	1989	30000	Aswan
12	Wadi El Assuti Protectorate	1989	35	Assuit
13	El Hassana Dome Protectorate	1989	1	Giza
14	Petrified Forest Protectorate	1989	7	Cairo
15	Sannur Cave Protectorate	1992	12	Beni Suef
16	Nabq Protectorate	1992	600	South Sinai
17	Abu Galum Protectorate	1992	500	South Sinai
18	Taba Protectorate	1998	3595	South Sinai
19	Lake Burullus Protectorate	1998	460	Kafr El Sheikh
20	Nile Islands Protected areas	1998	160	All Governorates on the Nile
21	Wadi Degla Protectorate	1999	60	Cairo
22	Siwa	2002	7800	Matrouh
23	White Desert	2002	3010	Matrouh
24	Wadi El-Gemal/Hamata	2003	7450	Red Sea
25	Red Sea Northern Islands	2006	1991	Red Sea
26	El Gulf El Kebeer	2007	48523	New Valley
27	El-Dababya	2007	1	Qena
28	El-Salum	2010	383	Matrouh
29	El-Wahat El-Bahreya	2010	109	6^{th} October
30	Mount Kamel Meteor Protectorate	2012	8	New Valley



Map 5: Name and location of protected areas

A brief description of selected examples of protected area representing the different environmental categories follows:

Wetland Protected areas (Marine, Lakes & Riverine)

Most of these protected areas are located along the Red Sea and Gulf of Aqaba areas zones except El Sallum that exist along the Mediterranean Sea. They include interconnected marine and terrestrial sectors based on conserving coral reefs and accompanying systems, marine biome, mangrove bushes, marine islands and adjacent mountain and desert areas.

They are Ras Mohamed, Nabq, and Abu Galum protected areas on Gulf of Aqaba in South Sinai Governorate, Elba and Red Sea islands natural protected areas, Wadi El Gemal/ Hamata protectorate in Red Sea Governorate and Sallum in Matrouh Governorate.These protected areas are located largely in the Mediterranean shores and the Nile River banks. They specifically include some northern lakes and coastal zones as well as Nile islands. They protect resident and migratory bird habitats, assist in management of fisheries, local community's development and promote ecotourism.

Among these protected areas are Zaranik in North Sinai Governorate, Ashtum El Gamil in Port Said Governorate, Omayed in Matrouh Governorate, Lake Qarun and Wadi El- Rayan in Fayoum Governorate, and Saluga and Ghazal Islands in Aswan Governorate and the 144 Nile Islands and El- Burrullus in Kafr El Sheick Governorate.

In addition to the wetland protected areas, many areas having high biodiversity values are monitored for conservation and sustainable development purposes of these Lake Nasser is on the top of the list.

Lake Nasser is one of the most vital wetlands in Egypt as a key source of freshwater fishery that donates about 25% to 40% of the total production of inland fisheries. During 1992, fish production reached about 26,000 tons. The most common fish species was Tilapia that represented 97-98% of the total fish production from the Lake. As time goes on, Lake Nasser greatness increased and during the winter of 1995 their total number were approximated to about 200,000 individuals, rendering it as one of the most important wetlands in Egypt. Some birds' species are with international importance (e.g. Aythya neroca which is globally threatened) while others are confined to Lake Nasser; in addition to species of mammals, reptiles and the most famous Nile crocodile. During 2010, Lake Nasser's water birds were estimated with about 150 thousand birds belonging to 56 species, including 6 species globally threatened; Some birds' species are with international importance (e.g. Aythya neroca which is globally threatened) while others are confined to Lake Nasser. This indicates the relative stability in water birds population in Lake Nasser, However there is a growing pressure from agricultural and tourism activities but their adverse impact are relatively limited.

Desert Protected areas (Highlands, Valleys & Plains)

Most of those protected areas are located in Sinai and Eastern and Western Deserts. They include mountains, plains and wades. They protect flora and fauna diversity in these regions, regulate and promote safari tourism, and support local communities. They are the Al- Ahrash in North Sinai Governorate, Taba and St. Katherine in South Sinai Governorate, Al Omayed and Siwa in Matrouh Governorate, White Desert in New Valley Governorate, Wadi Asiuti in Assiut Governorate, and Wadi Allaqi in Aswan Governorate, El-Gelf El-Kebeer in El-Wadi El-Gedid Governorate, and El-Wahat El-Baharia in Giza Governorate (Fig 4).

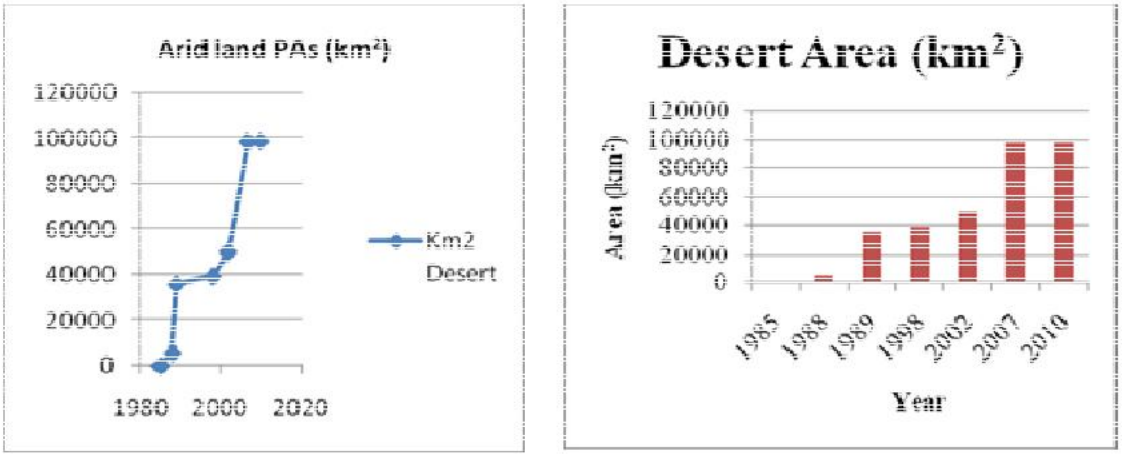


Figure 2: Development of desert PAs

The Saint Katherine Protectorate is one of Egypt's largest protected areas and includes the country's highest mountains. This arid, mountainous ecosystem supports a surprising biodiversity and a high proportion of plant endemics and rare. The flora of the mountains differs from the other areas, due to its unique geology, morphology and climate aspects. It is currently recognized as one of the central regions for flora diversity in the Middle East by the IUCN the World Conservation Union and Worldwide Fund for Nature (IUCN, 1994).

Several works have done in this area to determine the floristic composition of this area. A detailed fieldwork was done by Shaltout *et al*. (2004) to determine the floristic characteristics of SKP. Four hundered and ten species of vascular plants were identified in this survey. These species belong to 272 genera and 64 families. Pteridophytes have 2 species, 2 genera and 2 families; while Gymnosperms have 2 species, one genus and one family. On the other hand, Dicots have 343 species, 221 genera, and 53 families; while Monocots have 63 species, 48 genera and 8 families. The families that have the highest contribution to the total flora are six: Asteraceae (57 species = 13.9 %), Poaceae (47 species = 11.5 %), Fabaceae (36 species = 8.8 %), Brassicaceae (27 species = 6.6 %), Lamiaceae (22 species = 5.4 %), and Caryophyllaceae (18 species = 4.4 %). All these six families have collectively 207 species which represent 50.5 % of the total flora. The most frequent species in this study are five arranged according to their constancy percentage (C) as follows: *Zilla spinosa* (C= 66.2 %),

Artemisiajudaica (C = 62.9 %), *Fagoniamollis* (C= 58.9 %), Alkanna *orientalis* (C = 41.1 %), *Launaeaspinosa* (41.1%) and Seriphidium herba-*alba* (C = 41.1 %). Fifty eight species from 27 families were recorded by Moursy (2010) in another study in the same area. The most abundant families were Asteraceae (17%), Lamiaceae (17%), Brassicaceae (7%), Schrophulariaceae (7%), Caryophyllaceae (5%), Zygophyllaceae (5%).

Omar *et al.* (2013) aimed to determine the distribution dynamics of plants inside the high altitude area of SKP. A total of 113 species within 38 families were recorded within the study area. All of the conducted study aimed to develop an efficient and effective conservation strategy using complementary in situ and ex situ techniques

Geological Protected areas

They constitute unique geological phenomena identified as scientifically and touristically important destinations (Fig 5). They are Hassana Dome, Petrified Forest and Wadi Degla in Cairo Governorate, Sannur Cave in Beni Sueif Governorate, El-Dababiya in Luxor Governorate, and Niazak Gabal Kamel in El-Wadi El-Gadid Governorate.

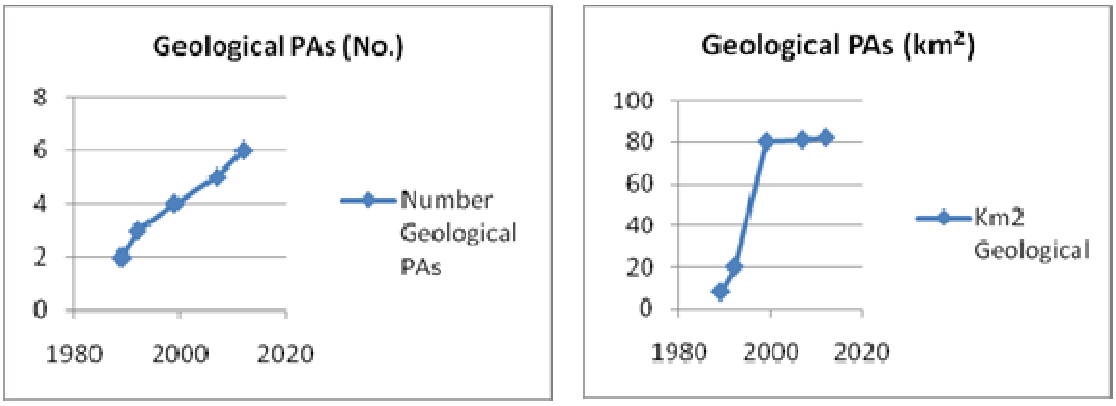


Figure 3: Development of geological PAs

5. Future Protectorates

Throughout Egypt activities to increase protected area to cover about 20% of its total area. Scientist and ecologist surveyed the whole country to nominate sites with ecological importance as well as national criteria to be declared as protected area. The preliminary survey resulted in identifying the following areas to be declared as national important area for conservation for harboring unique and critical habitat, species, and to accommodate endangered species (Table:4).

Table 4: list of important proposed areas for future protectorates

Number	Proposed Area	Governorate	area
1	Qattara depression	Marsa Matrouh	1380 km^2
2	Ras El Hekma	Marsa Matrouh	150 km^2
3	Alsheweila	Marsa Matrouh	225 km^2
4	Al Qaser	Marsa Matrouh	3700 km^2
5	Um eldabadeb	Alwadi elgedid	3500 km^2
6	Karkar wa Donqol	Aswan	4300 km^2
7	Gabl el shayeb	Red Sea	4300 km^2
8	Grand Red Sea Corals	Red Sea	1500 km^2
9	El Galalah el qebliah	Red Sea	4300 km^2
10	Malahet Ras Shuqier	Red Sea	75 km^2
11	Wadi Qenaa	Qena	5900 km^2
12	Al kasemah	North Sinai	400 km^2
13	Al Magharah	North Sinai	900 km^2
14	Wadi gerafi	North Sinai	1100 km^2

6. Renewable natural biodiversity resources

Renewable natural biodiversity resources in Egypt are mainly represented by farmlands, coastal belt, fisheries, wild animals, birds and natural vegetation. The renewable resources of farmlands and water (agriculture) are limited, not exceeding 7 million feddans or 60 billion m^3 espectively. With the increase of population, the share of farmland per person contentiously decrease that underlines special significance of measures to conserve and sustainably use these limited natural resources. Fisheries prevail along the coasts of Mediterranean and Red Sea, northern lakes, inland lakes (Qaroun, Wadi Rayyan, Nasser), and River Nile and its associated irrigation networks. Aquaculture and mariculture are on the increase and use both local and introduced species of fish. Wild animals (gazelles and antelopes), and resident and migratory game birds are under pressures of excessive hunting. This is one of the major causes of deterioration and sometimes complete loss of wildlife. Natural vegetation, though often thin and widely dispersed, provides the desert inhabitants with resources of considerable importance fuel for their consumption and charcoal and medicinal herbs as cash crops. Excessive collection is a cause of deterioration of the vegetation and the loss of species.

Over 1.2 million birds of prey and 500,000 storks migrate along this corridor between their breeding grounds in Europe and West Asia and wintering areas in Africa each year. In total, 37 species of soaring birds (raptors, storks, pelicans and some ibis), five of which are globally threatened, regularly use the flyway. While these birds are relatively well conserved in Europe, and valued in east and southern Africa as part of the game park experience, they receive practically no conservation attention during their migration. Yet this is where the MSBs are the most physiologically stressed and in some species 50-100% of their global or regional populations pass along the route and through flyway “bottlenecks” (strategic points where soaring birds are funnelled, either to make water crossings or to maintain flying height) in the space of just a few weeks. As a result, MSBs are at their most vulnerable during the migration along the Rift Valley/Red Sea flyway. These large, highly visible slow-moving birds are susceptible to localised threats during migration, such as hunting and

collision with wind turbines (particularly when they fly low or come in to land), which could have severe impacts on global populations. Most MSBs are predators at the top of their food chain and occur across a wide range of habitats. Removing these birds, by allowing threats to their populations to continue, would upset the balance of prey populations and disrupt the assemblage of species in the critical ecosystems of both Europe-West Asia and Africa. Egypt had put a lot of efforts for conservation of migratory soaring birds by controlling and manage the hunting practices by seasonal permits depends on seasonal assessment of the migratory bird situation.

The Nile crocodile*Crocodylus niloticus*is an African crocodile and may be considered the second largest extant reptile in the world. The Nile crocodile has a long established community at Lake Nasser.In 2008 the crocodile task team was formed and started multiple survey along the lake to evaluate the number of crocodiles. The survey was interrupted because of several seasons of them lake of funding. The unofficial estimate of crocodiles is 12,000 to 15,000 individuals. The sustainable ranching of Nile crocodile is of prime importance as the crocodile is a natural asset that can be sustainably developed for its meat, skin and eggs as what is happing in 42 African countries.

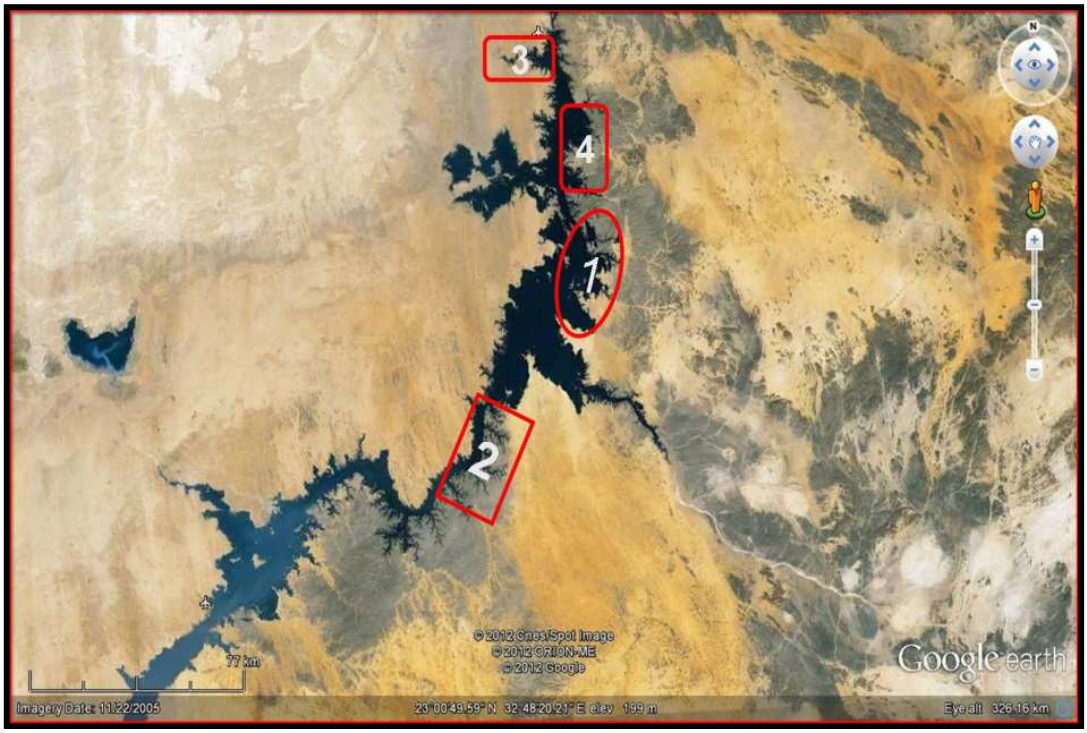


Figure 4: Crocodile monitoring stations

7. Non-renewable natural biodiversity resources

The ground waters resources of the deserts of Egypt are mostly fossil water stored since the rainy periods and are used in irrigating arable lands of the oases of the Western Desert and to a limited extent in Sinai. Development of Nubia Sandstone aquifers in southern parts of the

BACKGROUND

Western Desert includes East Oweinat programme and Darb EI-Arbaeen (extension of the Toshki irrigation scheme) programme.

CONSERVATION OF NATURAL BIODIVERSITY RESOURCES

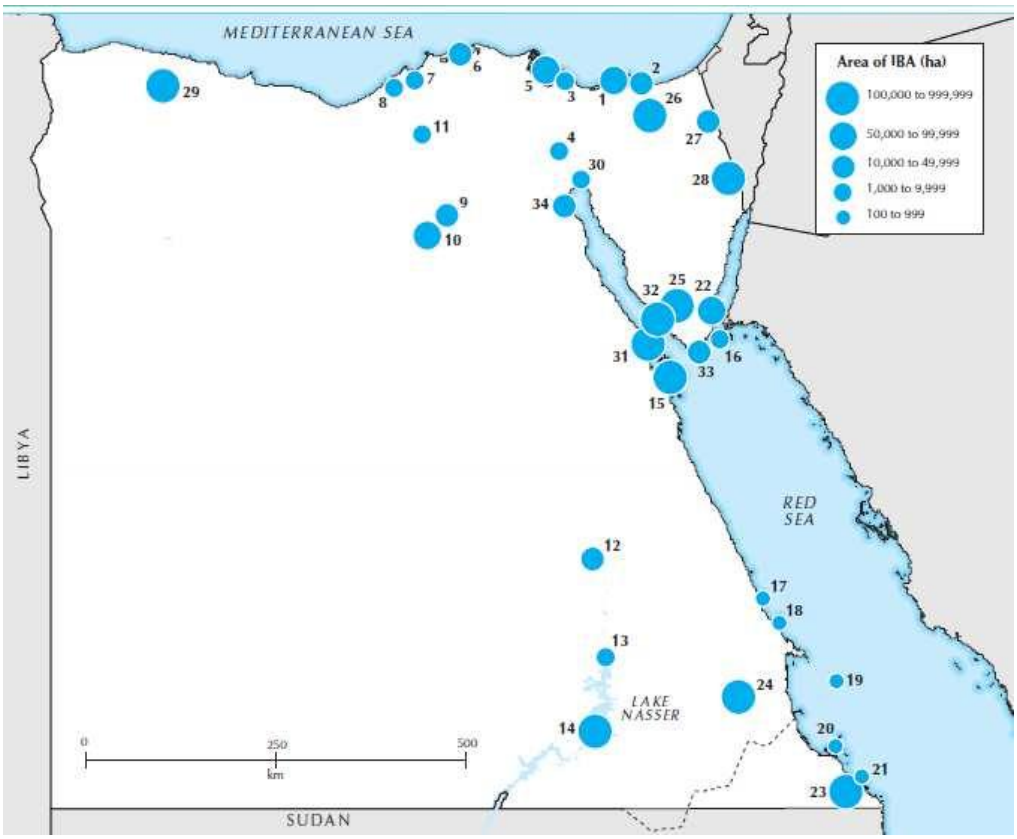
III. Conservation of natural biodiversity resources

Encouragement of biodiversity and habitats conservation is one of the main national priorities in line with the global goal (achieving at least 10% of the effective protection of each ecosystem in Egypt). Current and future planned protected areas, that represent different habitats, had been covered and included within Map of State Land Use of Egypt, to be considered in the future planning of land use processes.

National targets were developed for specific action programs (agricultural biodiversity, inland water, coastal and marine ecosystems, arid and semi-humid and mountains ecosystems) then included within National Environmental Action Plan (2002-2017), relevant national strategies (i.e. wetlands, eco-tourism and medicinal plants).

Emphasis was engaged to marine areas, wetlands and mountains (Elba - St. Catherine PAs), arid and semi-arid area. Protection was afforded to areas with special interest (fish nurseries, coral reefs and mangroves areas); in addition to areas with endangered species (e.g. Turtles, Gazelle and Dolphins). In the future, focus will be targeting fresh water and agro-biodiversity.

There are a total of 34 Important Bird Areas (IBAs) in Egypt (Map 6), comprising a wide range of habitats critical for birds, such as wetlands, high altitude mountains, desert wadis, coastal plains and marine islands. They cover an area of 35,000 km2 or some 4 % of Egypt's territory. Fifteen IBAs, approximately 44%, fall entirely within the existing protected area network. All of Egypt's avian habitats are represented within the identified network of IBAs, although not equally so.



Map 6: Important Bird Areas (IBAs) in Egypt

Zaranik protected area is consider one of the most priority sites for migratory birds where 217 species had been recorded during past five years representing 89% of the total number of birds species (245 species) recorded since seventies until now; this means that Zaranik PA still retains more migratory birds species, some of which are endangered and worthy at a global level, which confirms the standing of the region as one of the most significant migration routes for birds in the world.

In Manzala lake, especially Ashtom El-Gamel Protected Area more than 34 thousand birds during (October, November and December) with monthly average of up to 11 thousand birds from 83 species were monitored, including 6 species of regional and international standing; in addition to verifying the second largest breeding colony of Larus genei in Port Fouad (estimated with 6 thousand birds).

As regards the habitat diversity, conservation programmes focused on the selection of habitats with relatively high richness in biodiversity, those harboring species of special interest (endemics, rare, endangered or extinct), or those with natural formations (geological or geomorphological) with special scientific, cultural or aesthetic value. Ecosystems apt to harsh and/or irreversible modifications associated with development programmes and misuse of resources also feature high on the list of habitat types eligible for conservation.

In conservation programs of species diversity, priority was given to endemics and near endemics as well as to rare and endangered species, species with critical taxonomic orevolutionary significance, the close relatives of domesticated plants and animals and those with high industrial value (e.g. medicinal plants), and sources of special products. Conservation programs also gave precedence to species with a wide range of morphological and/or physiological plasticity (i.e. a relatively large number of biotypes), and to species with a wide range of ecological plasticity (i.e. a relatively large number of ecotypes), as well as those with other features that might suggest the presence of special genes or genomes in them. This also included the conservation of cultivars and races that had a significant role to play in farming and still amass a useful genetic make-up but had been replaced by other varieties and races in the wake of green revolution. Conservation of such cultivars and races is the work of the gene bank. In this connection, special mention should be made of the multitude of cultivars and races of some crops (e.g. cotton, wheat, rice, dates, etc.) and farm animals (cattle, chicken, goats and sheep).

1. Successful models

Coastal and Marine Species Diversity: The Egyptian coastal and marine environment is distinguished by specific habitats and threatened species, such as marine mammals (17 species), marine turtles (4 species), sharks (more than 20 species), sea cucumber, special bivalves (clams), coral reefs, mangrove trees and many birds (white eyed gulls , sooty falcons, ospreys). This is in addition to great biodiversity (more than 5000 species), including 800 species of seaweeds and sea grasses, 209 species of coral reefs, more than 800 species of molluscs, 600 species of Crustacean, 350 species of Echinodermata, and many others yet to be discovered in the Exclusive Economic Zone in the Red Sea (Fouda 2009, 2013).

The conservation status of species found in the Mediterranean Sea, between southern Europe and northern Africa is Critical/Endangered. A total of 19 species of cetaceans can be found in the Mediterranean, with eight of them considered common to the Mediterranean (Fin Whale, Sperm Whale, Striped Dolphin, Risso's dolphin, Long Finned Pilot Whale, Bottlenose dolphin, Common dolphin, Cuvier's beaked whale), four considered occasional (Minke Whale, Killer Whale, False Killer Whale, Rough Toothed Dolphin) and 6 considered alien to the Mediterranean, but have been occasionally sighted in the last 120 years (the Humpback Whale among them).

Flora species: Flora surveys had been run during the years,2010, and 2013 in the high mountains of St. Catherine Protected Area (northern sector) to identify and follow-up status of its vegetation coverage and prepare a complete database about their plants including the scientific name, botanical family, economic importance, geographic distribution, negative impacts on wild plants and the most fitting environment for their growth.

In 2015 a survey conducted to identify plant diversity and vegetation composition for 10 plant species (5 endemic and 5 near endemic, Table:7) as well as mapping the distribution of the target plants within the boundaries of the protected area with the help of geographic information technologies (Geoinformatics). Moreover the study aimed to determine the requirements and priorities for conservation to protect these plants by using the standards of the IUCN.

Table 7: Target Flora species within St. Catherin protected area.

No.	*Species Name*	Status	Arabic Name
1	*Anarrhinum pubescens*	Endemic	الأرفيجة
2	*Bufonia multiceps*	Endemic	العدمة
3	*Euphorbia obovata*	Endemic	اللبينة
4	*Phlomis aurea*	Endemic	العورور
5	*Rosa arabica*	Endemic	وردة كاترين (الورد البرى)
6	*Polygala sinaica*	Near Endemic	الهيكل
7	*Nepeta septemcrenata*	Near Endemic	الزيتية
8	*Salvia multicaulis*	Near Endemic	المردقوش
9	*Hypericum sinaicum*	Near Endemic	شاى الجبل
10	*Origanum syriacum*	Near Endemic	زعتر كاترين

Mangrove trees: Studies done by remote sensing and field testing confirmed that total area of mangrove trees increased to 700 hectare by the end of 2009, compared with 525 hectare in 2002 (Fouda, 2009). This is mainly due to impeding encroachment and starting transplantation programs in many areas along past years, where more than 50 feddan were cultivated with more than 50 thousand seedlings of both mangrove types (*Avicennia marina* and *Rhisophora mucronata*), and the establishment of nurseries in Nabq, Safaga ,Wadi El-Gemal and Shalatin. In addition, a biological study was conducted on mangrove trees (height, volume, density, fruit production, and flowering period) proved that mangrove habitats are portrayed by high biodiversity. Biotic communities so far recorded in Red Sea mangrove ecosystems (Fig 4) included more than 22 fish species, 36 species of algae, 40 insect species, 82 Crustacea species, 65 Mollusca species and 17 Echinodermata species. However, the diversity of macro invertebrate fauna (crustacea, molluscs and echinoderms species) reported in 2006 (27 genera) were lower than those recorded in 2002 (33 genera) while the coral cover in the fringing reefs adjacent to the mangrove did not change.

Figure 4: Mangroves provide habitat for a large number of faunal assemblages of marine organisms including a high diversity of fish, crustaceans, mollusks and echinoderms.

Many terrestrial organisms and avifauna visit mangroves for reproduction, food and shelter. They are surrounded by very rich habitats including coral reefs and sea grasses. They act as nursery for juveniles of commercially important fish species.

Sea Turtles: Loggerhead and Green Turtles have been listed as Endangered by the IUCN while the Leatherback Turtle is listed as Critically Endangered (UNEP/MAP 2012). While the Loggerhead remains relatively abundant, it seems to have almost deserted the Western Basin. The Leatherback and Green Turtle are becoming increasingly rare. Marine turtle monitoring in the Red Sea and Mediterranean is considered to be one of the most successful monitoring programs in large part due to the existence of specialists in this field for more than 10 years. The Red Sea is known to host nesting sites for the endangered Green Turtle, the most important ones being located in Saudi Arabia, Djibouti, Sudan and Egypt. Nesting activities along the Egyptian coast was described as low-density and scattered with three major concentrations: Tiran Island (Northern Red Sea), Wadi Gemal National Park (Southern Red Sea, in-shore) and Zabargad Island (Southern Red Sea, off-shore).

During 2009/2010 numbering of marine turtles along the Egyptian coast of the Red Sea was fulfilled. There were 47 green turtles on Zabarged island (Red Sea) in addition to monitoring 3 turtles numbered during 2006, getting the total number of numbered turtles on Zabarged Island to 121 one. Surveying of different regions ran throughout 2010, confirmed 1960 old nest and 1347 new one in Zabarged Island, which is well thought-out one of the most important nesting areas of the green sea turtle, *Chelonia medas*, on the Egyptian coast. Marine turtles monitoring program in Red Sea and Mediterranean recorded four species of marine turtles (green, loggerhead, hawksbill and leather back) in 15 sites on the beach andislands. They have been monitored; with high percentage of nesting in El-Zabargadis land (5336 nests were found in 2007 and remained stable in comparison with 438 in 2001). El-Giftoun Island is rich with hawksbill turtles where 21 nests were found in 2001 and increased to 255 nests in 2007. A satellite tracking monitoring program for green turtles was imitated also last year 2012 in Wadi El Gemal National Park.Results obtained from irregular surveys between 2001 and 2008 suggested that as many as 610 turtles could nest on the 3.5 km long beach on the island

Nesting success (NS) was calculated as the number of true nests divided by the total number of observed tracks. Recently, the total number of true nests on the island was estimated at 2,262.51±531.27 in 2009; 1,073.90±268.80 in 2010 and 1887.29±388.97 in 2012 while the total number of true nests was 227 in 2009, 130 in 2010and 510 in 2012. The Nesting success was 10%, 12%, and 27% in 2009, 2010, and 2012 respectively.Green turtle population in the Red Sea is estimated to be around 450 nesting females per year (El-Sadek *et al.*, 2013).

Dolphins: In early 2000, divers discovered Samadi area, south of Marsa Alam city, in the Red Sea where large and young dolphins occured. It is worthy note that divers, snorkelers, and vessels had dramatically increased in this area leading to improper behavior represented by chasing dolphins, making noise in the water, and in some cases, vessels were set on fire accidently resulting in dolphin's desert for about two weeks which resulted in number decreased.In 2004,after one year of implementing a management plan, dolphins had been increased from 32 to 78 and associated with an extraordinary increase in coral reefs growth. The establishment of Abu-Salama association (NGO) for dolphins led to protecting them reaching 120 dolphins on daily basis during summer.

In 2015 Shawky *et al.* photo identified 255 individual of spinner dolphin Stenella longirostris within a population size range of 567 to 637 individuals of dolphins utilizing Samadai area in daytime for resting and socializing. From the 255 identified dolphins, 33 individuals (12.9%) were re-sighted for 4-8 times and 131 individuals (51.4%) were only observed once. The discovery curve indicated the continuous entrance of new animals to Samadai reef, especially

between May and December, this may represent a positive indicator of good environmental status in Samadai after implementation of conservation strategy.

Sea Cucumbers: Sea cucumbers are benthic marine invertebrates playing an important role reminerlization of nutrient salts and are classified under phylum Echinodermata. They feed on benthos and organic materials improving water quality. There are around 36 species of sea cucumber in Egypt; some species live in shallow water close to coral reefs and sea grass (86-95 sea cucumber/100m^2). Fishing of sea cucumber started in 1998 by fishermen outside Red Sea area, using illegal fishnets that lessened their numbers to 30 sea cucumber/100 m^2. The total catch of sea cucumber was valued as 12000 animals annually. These activities resulted in the increase of mortality of non-professional divers that reached more than 30 cases, due to high price of sea cucumber. Accordingly, fishing of sea cucumber was outlawed since 2001. Studies were then conducted to know the impact of sea cucumber overfishing and depletion on the marine environment.During 2001-2003, field surveys validated the gigantic decrease in their numbers and densities that reached 10 animal / 100 m^2. Most of the areas that experienced illegal fishing became empty from sea cucumber (compared with 30 animal /m^2) in protected areas.In addition to the decisions taken to preclude catching of cucumber and the continuous monitoring of its depletion, measures were taken to culture sea cucumber at laboratories of both Suez Canal University and Ras Mohamed National Park. Results had shown substantial success of breeding sea cucumber that could be released into the sea.

Whale Shark: Whale shark is one of the hugest marine creatures with a size analogous to whale reaching 15 meters in length and 20 tones in weight. It lives in tropical areas and feeds on plankton and is characterized by a calm behavior. Whale shark is a threatened species as it is recorded in the Red List of IUCN hence requires unifying efforts to be protected from extinction (Fig 5). Researchers in Red Sea and Gulf of Aqaba conducted studies to monitor whale shark and conducted questionnaire on its distribution. Thirty five whale shark, were watched from 2003 until February 2008 in Dahab, Sharm El-shikh, Ras Mohamed, Hurghada, Quseiur, Marsa Alam, Port Ghaleb, Elswany Islands, Elsayal, Elsokor, and Elafiston. The highest record was during spring time (12 whales) and at the end of summer (9 whales). This indicated that whale shark migrates from one place to another. In 2015 multible record were confirmed for whale shark and took place at Marsa Alam and Hurghada.

The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden(PERSGA) conducted a study about shark species in the Red Sea indicated the presence of 33 species. While latest studies conducted by Red Sea Protected Areas indicated that recorded species did not exceed 17 despite the availability of recent monitoring equipment such as appliances of diving, photography and measurement of water chemistry. These results pointed to a loss of sharks' diversity up to 30% of the recorded species during past fifty years mainly due to the steady increase in the interactions between human and sharks over the past years; increase in sea water temperature; feeding fish and sharks by tourists; over-fishing; nature of the bottom of Red Sea and Gulf of Aqaba and dumping of ships and boats' wastes crossing the Tiran Strait.

Shawky and De Maddalena (2013) studied the human impact on the presence and behavior of sharks from June to November 2008 at some Red Sea diving sites. . A total of 292 individuals belonging to eight species of sharks the recorded species include: whale shark Rhincodon types (1 specimen), pelagic thresher shark Alopias pelagicus (12), silvertip shark Carcharhinus albimarginatus (1), grey reef shark Carcharhinus amblyrhynchos (61), silky shark Carcharhinus falciformis (2), oceanic white tip shark Carcharhinus longimanus (123), whitetip reef shark Triaenodon obesus (5), scalloped hammerhead Sphyrna lewini (87).

Presence of recreational divers was recorded during almost all the dives by 134 dive of of 138 dives, with a presence of a total of 971 boats and 15,601 divers.

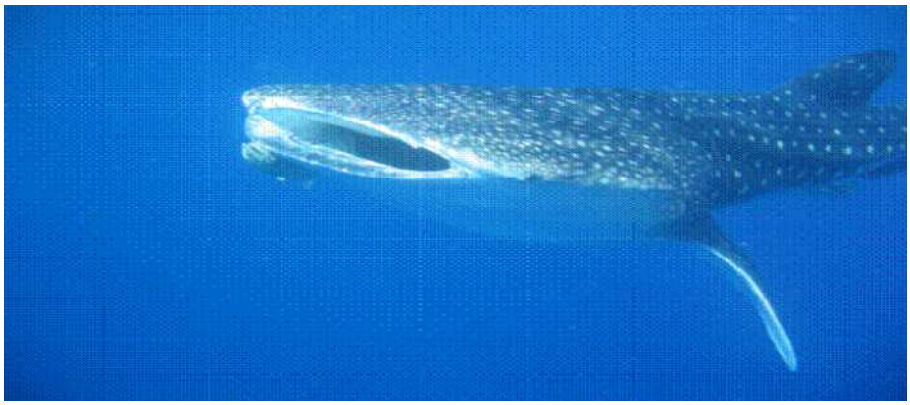


Figure 5: Whale shark

The massive human presence in Elphinstone Reef is negatively affecting the presence of sharks and might also increase the probability of attacks on humans occurring. The number and conduct of boats of divers and boats frequenting this site need to be regulated by appropriate rules. It is therefore urgently necessary for Elphinstone Reef to be declared a protected area.

Dugong: is one of the most threatened species in the world, and their size reaching more than 2 meters in length, typically found in sea grass beds (Fig 6). A follow-up plan to monitor dugong in Red Sea had been implemented through distributing questionnaires on dive centers and safari boats covering most of the diving areas in Red Sea. 195 questionnaires were distributed among which 102 were received customarily recording observations of dugong in Abu Dabab bay due to the presence of their natural environment rich with marine grass. A total of 50 Dugong (mermaid) were recorded. The largest number of dugong (17) was recorded during summer 2007. Recently several records of dugong took place along the stretched coastal area of the Red Sea from El- Qusier down to Shalateen. Moreover, dugong ecology and community structure intrigured conducting monitoring program within protected areas, these efforts resulted in rescuing a calf who got trapped during low tide at Wadi El Gemal protected area in 2015.

Figure 6: Dugong: a famous marine mammal in the Red Sea (SOE 2007, 2010)

Deer: Red Ghazal (*Gazella dorcas*) is one of the most important components of Egyptian desert ecosystems. It is one of the (browsers) contributes in pruning scattered plants in the area of its presence; on the contrary to (grazers) that destroy most of the vegetation coverage. Being talented of adapting with desert harsh conditions, it acts as an indicator of the soundness of the environmental ecosystem.

Coral Reefs: Egypt's coastline holds a significant range of the most amazing universal coral reefs that is found in Red Sea along an area reaching nearly 3800 km^2. The coral reefs spread from North to gulfs of Suez and Aqaba and Ras Hedarba in the South at the border of Sudan. Most coral reefs are situated along the coast and surrounding off shore islands. They are however not continuous because periodic flooding from wadies created gaps within coral reef system. Among 300 hard coral reefs species found in Red Sea, 2/3 were found in Egyptian reefs (Table 8), including some endemic species (Kotb *et al*. 2001). The total economic worth of coral reef could be imitating from the value of all goods and services delivered by marine ecosystems.

Table 8: Number of genera and species of reef-building corals in Red Sea (Kotb *et al.*, 2001).

Region	Gulf of Aqaba	Gulf of Suez	North Red Sea	Central Red Sea	South Red Sea
Genera	47	25	45	49	31
Species	120	47	128	143	74

Coral reefs rank as the most diverse and productive natural ecosystems, their high productivity stemming from the fit biological recycling, high retention of nutrients and structure complexity that provides habitat and food for vast numbers of organisms. The world conservation strategy (IUCN/UNEP, 1985) announced coral reefs as "one of the indispensable life support systems" for food production, health and other features of human survival and sustainable development. The areal extent of coral reefs is small compared to the entire ocean, but large compared to shallow water areas. Following their shapes, they are classified according to their relationship with land as fringing reefs. It was estimated that coral polyps need about 10,000 years to form a reef and 100,000 to 30 million years to build a fully mature reef. Polyps are only able to build a reef with the help of single-celled *Zooxanthellae* algae.

At the Southern House Reefs, both coverage and diversity of coral reefs community from 2005 to 2011 were strong-minded and analyzed (Fig 9) and ranked as follow, site displayed an increase in living percentage cover included House Reef of North Shams Alam Resort and sites exhibited a decrease in living coverage included House Reef of Marsa Shagra. Percentage of coral cover was ranged between 31-100 % which is high compared to sites in the northern area of Red Sea indicating high density of coral cover in the southern region at Red Sea.

The effect of patrolling and diving pressure on coral reef in 15 sites in Red Sea in Hurgahada area & 7 in Southern area was monitored**.** The good patrolling system by Red Sea protected areas helped reduce of coral damage by swimming tourists and increase of coral cover. The presence and the continuous maintenance of mooring system revealed to be effective, as the

number of coral colonies damaged by anchoring is dramatically reduced. Violations in coral reefs during the last 10 years amounted to 600 violations for hotels, other tourism establishments, ships and individuals. These had led to destruction of coral reefs in many sites with economic loss of tens of billions of Egyptian pounds (Figs 10, 11 & 12).

The northern part of Red Sea has the highest coral diversity (Table 7) and number of islands while the south has the highest terrestrial biodiversity for the whole country. Coral reefs sustain valuable fish species, live coral cover of Egyptian reefs averages 48% and major fishes are the butterfly fish (*Chaetodontidae*) with 7.2 per 500 m^3, parrotfish (2.2 per 500 m^3), snapper and grouper (0.8 per 500 m^3). Valuable pelagic or migratory species such as mackerel and tuna also partly depend on reefs as often feed on small reef-bases fish and in some cases to spawning area. The bait for pelagic fishes usually comes from reef area. Numerous other products are found on reefs, including aquarium fishes, mother-of-pearl and others.The total number of reef fish found in Egyptian Red Sea is 325 of which 17% are endemic species.

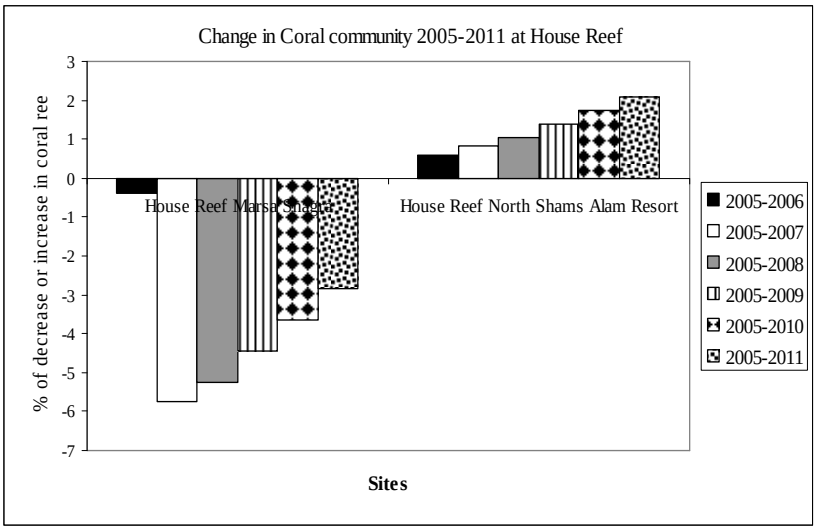


Figure 7: Change in coral covers percentages

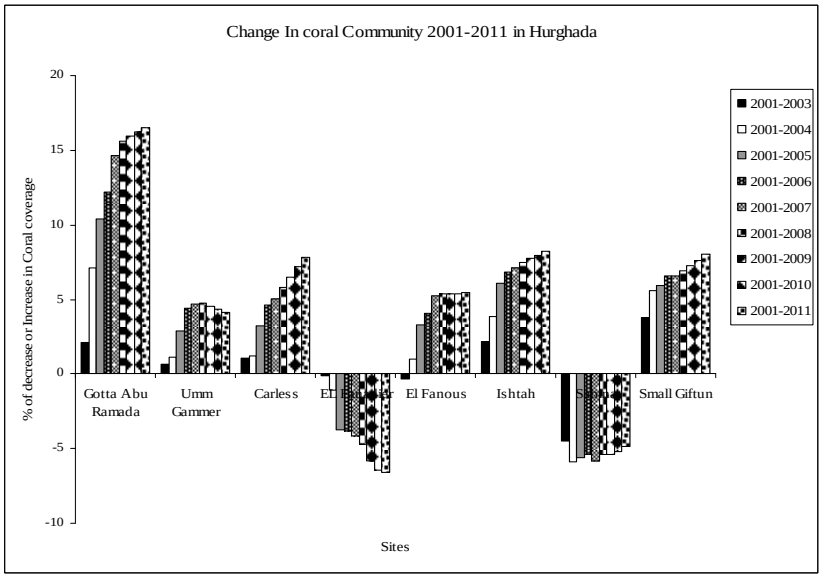


Figure 8: Change in coral coverage in Hurghada, 2001-2011

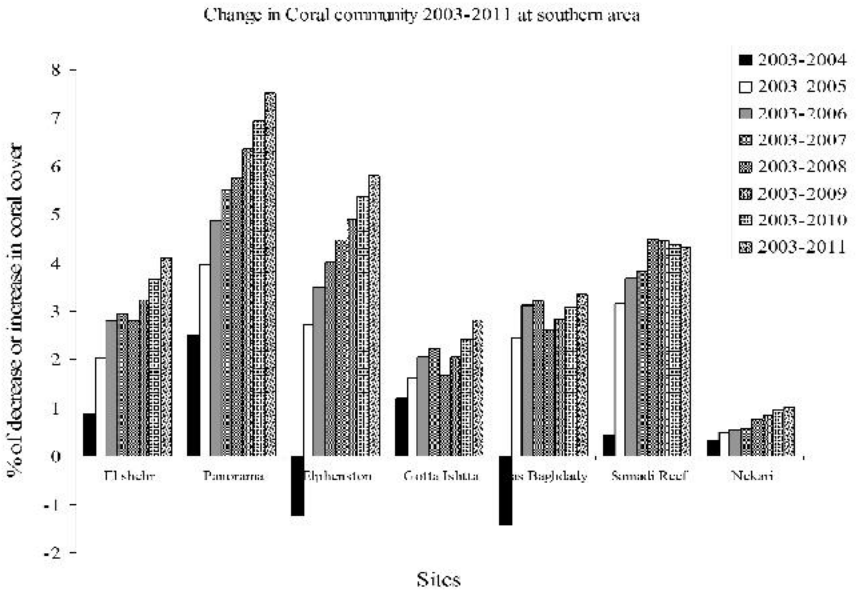


Figure 9: Change in coral coverage in Southern sites, 2001-2011

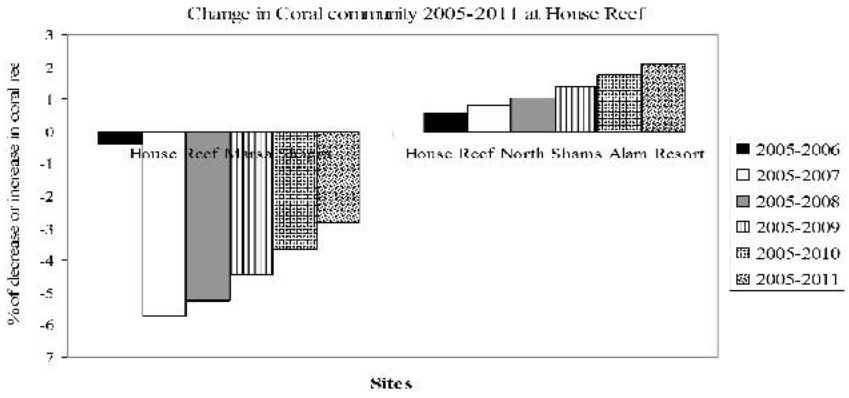


Figure 10: Change in coral coverage in Southern House Reefs, 2001-2011

Recently, Butterfly fish had decreased in Red Sea from an average of 9.7 per 100 m^2 to 5.2 per 100 m^2 in 2002, and Sweetlips populations dropped by 69% (Hassan *et al.* 2002). On The other hand in 2005, the distribution of butterfly fish along the proper Red Sea coast of Egypt was studied and recorded an average number of 6.9 species ±1.7 / station. The abundance of the recorded 10 species of butterfly fish was 27± 11 fish/100 $m^{2.}$ (Temraz and Abou Zaid, 2005).

In addition, the abundances of groupers and parrotfish in Egyptian Red Sea had also decreased and this might be due to lack of enforcement of law where poaching in the no take zones is high (Hassan *et al*. 2002). About 60% of Red Sea coral reefs were assessed as at risk primarily due to coastal development, overfishing, and the potential threat of oil spills in the heavily trafficked Arabian Gulf and southern end of Red Sea.

Since 2001 Red Sea coral reefs status in Egypt had been monitored in more than 120 sites in Red Sea and Gulf of Aqaba, using environmental indicators (living/nonliving coral reefs, number of species, and other indicators such as fish and vertebrates). The studies indicated that coral reefs status inside protected areas is better than elsewhere. In addition, sites, that

are far away from human activities had witnessed increase in coral reefs (14%) compared with areas with human activities (5-7%), where soft corals have been increased at the cost of hard ones (Attalla, *et al* 2012).

Table 9: Key coral reef indicator species abundance in 2002 and 2008

Abundance (fish number per 100 m^2 reef)	2002	2008
Butterfly fish	8.6 ± 0.36	6.10 ± 0.07
Sea urchin (*Diadema*)	< 5	< 1
Giant clam	2.2 ± 2	3.0 ± 1.4
Grouper	0.77 ± 1	0.74 ± 0.03
Lobster	0.02 ± 0.08	-
Parrotfish	2 ± 1.6	2 ± 0.4
Sea cucumber	< 1	Nearly 0
Snapper	5 ± 5	11 ± 10
Sweetlips	0.4 ± 0.1	0.8 ± 0.05
Triton	<1	-

Worldwide climate change impacts on biodiversity have been recorded throughout several monitoring programs: coral bleaching in 2007; Ombet trees (*Medemia argum*). On elevated areas of Elba Mountain; medicinal plants in the St. Katherine Mountain; and the Sinai Baton Blue (*Pseudophilotes sinaicus*) with a home range that doesn't exceed 5 km^2.

Tourism, one of the main sources of Egypt's national income, is predicted to be affected in the future by climate change. The number of tourists coming to Egypt's coasts each year is expected to decline because of the potential impact of climate change on coral reefs. Worldwide, almost all coral reefs have been affected by climate-change induced coral bleaching at one time or another. Corals depend on a certain kind of algae (*Zooxanthellae*), using the nutrients they produce while providing the algae with physical support, protection and maintenance in adequate levels of sunlight for photosynthesis. When exposed to high water temperatures (more than 1°C or 2 °C rise in sea surface temperature above normal summer maximal temperatures for a period longer than 3–5 weeks), corals expel the algae, resulting in loss of coral color.

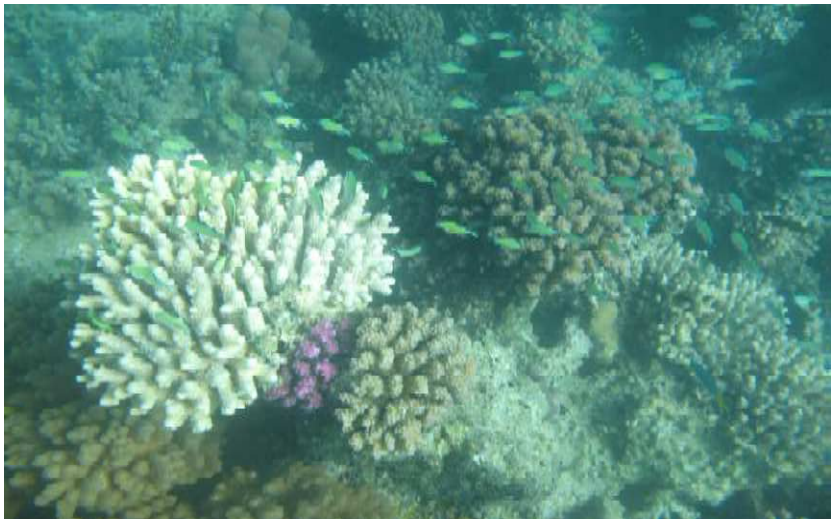


Figure 11: Coral Bleaching in the Red Sea

2. Successful stories

Crown of thorn starfish: Crown of thorn starfish is classified under the phylum Echinodermata and they are illustrious by many arms and toxic spines and feed on coral reefs. In normal circumstances, they don't exceed small numbers of 10 m², but in some cases they increase greatly in number and accumulate over each other until reaching 50 starfish/m² triggering serious problems on coral reefs. During 1994, excessive numbers of Crown of thorns were recorded, reaching 370 in two sites at Ras Mohamed National Park, and then they spread in 13 other sites. During 2000 some other 37 sites were experiential in Ras Mohamed and soon they spread to the north along the Gulf of Aqaba reaching Dahab, and to the south reaching Hurghada on the Red Sea (more than 30 sites). More than 100 000 individual were recorded, leading to the death of more than 40% of the coral reef colonies. In 2001, great efforts were exercised from protected areas staff, NGOs and volunteers from Sharm El-Sheikh, Dahab and Hurgada. They collected 150,000 starfish. In 2002 and onwards, their numbers had been radically decreased, and the coral reefs also recovered, exhibited by an increase in growth rate (10 cm/year).

Sooty Falcon (Falconconcolor): The sizeable colony of *Sooty Falcon (Falconconcolor)* in Wadi El-Gemal Island is thought as one of the topmost colonies in number. It is an endangered species that had been monitored since 2004 to collect data on their migratory season, breeding season, incubating egg period and parental care. Breeding time starts at spring and egg hatchling in summer. Thereafter migrate towards East of Africa in September and October. Numbers of Sooty Falcon are virtually the same during the past five years, in spite of the increasing number of nests from 73 in 2004 to 94 nests in 2007

Biodiversity of arid lands: Aridlands cover 92% of Egypt joining different environmental systems; Western Desert (681 thousand km^2) formed of equatorial plateau in its greater portions (significant plateau of El-Gilf El-kebir and El-Ouwaynat Mountain); and many depressions (El-Qattara, Siwa, El-Fayoum); in addition to parallel belts of sand dunes lines (Bahr El-Remal El-Aazm). As for Sinai Peninsula (61 thousand km^2) it is thought as a huge mass of basic formation with high rough peaks (Saint Catharine Mountain), valleys and some oases (EL-Fyran). Valleys are well-thought-out to be one of the main features of deserts, in addition to surface rocky, erosion pavement, gravel desert, slopes and cliffs; as all these habitats are categorized as vegetation cover differ from one place to another. Surface rocky habitat is very dry deprived of any existence of necessary requirements for plants growth except for some kinds of plants called rocky plants that insert their roots through rocks. In addition, little amount of rainfall in the desert might initiate small holes in rocks where some soil and water are collected, giving rise to growth of seasonal plants.

The upper layer of the second habitat (erosion pavement) is covered with fine gravel mixed with some round rocks, and this layer might be even or wavy. Surface water concentrate in water courses lined with layer of fine sand, therefore plants find an appropriate ecosystem for their growth. In gravel desert habitat, surface sedimentations are composed for the most part from movable substances and not from substances emerged from broken infrastructure soil. Winds blow sands away from surface of gravel deserts, precisely in heights leaving little stones on surface bare of soil. However they shelter underneath soil from being motivated by winds; appropriately, they are well thought-out to be a protective shield for soil. Little stones interfere and connect to compose a solid layer, where roots of plants couldn't penetrate. For that reason gravel deserts are deliberated to be a barren environment, where plants couldn't grow excluding some rocky trees and soil moss. In some areas constitution of solid gravel cover does not comply with on surface of earth, however it become little, distant and mixed

with large amount of fine soil. In that kind of environment some seasonal and annual plants could grow.

Habitats of slopes are found at edges of plateaus and sides of valleys, mountains and hills. Surface of such habitat is covered with rocks' crumbles, composing fitting consistency for plants' growth, as there are small pockets within surfaces of rocks where sands and water concentrate composing suitable environment for plants' growth particularly those tolerating dryness. In slopes of high mountains, vegetation cover is intolerant by elevation factor; where bottom parts of these slopes collect large amount of rain water than upper parts. This leads to a change in plants types from bottom to upper part of the mountain. This phenomenon is perceptibly clear in Red Sea Mountains and Sinai Peninsula. Cliff's habitat is well thought-out to be very drought environment that hinder plants' growth except from some little kinds using rocks clefts that are depressed from the formation of surface soil. Only sands, carried by winds are gathered inside clefts. In the presence of little amount of water, seeds of some plants, adapted with that kind of habitat, and could germinate.

Valleys are well-thought-out to be the most essential ecosystem in the Egyptian deserts, as they encompass drainage systems for waters of rains and floods. For that reason, they receive huge amounts of water than other ecosystems. Then, their vegetation cover is heavy, but at the same time exposed to oppressive cut and over grazing. Their structures are formed of rocks' crumbles that vary from being tiny sand particles to large stones. Quantities of water and soil are the main factors that shape the quality of vegetation cover in valleys. If the soil is delicate and surficial, it is wetted during rainy season but they dry out fast. In that kind of soil that is not gifted to preserve water, only short lived vegetation cover (seasonal) could grow. As for deep soil, that allow to maintain greater amount of water underneath its layers and accordingly they are considered to be a steady source of perennial plants with deep roots including herbal plants, trees and bushes.

Habitats of assorted sand dune formations that are broadly spread in Egyptian deserts, such as sand dunes, are very crucial. Plants grow and overcome in that habitat (Sand dune stabilizer), having the ability to sediment sand borne by winds around them and accumulating them in different formations of heights and sizes of sand dune. These plants generate large number of horizontal roots from their stems and branches empowering them to overcome the problem of total burial with sand, as they have the capability to produce new branches uppermost; and in that case, branches and stems play the role of roots after being buried under sands. By this way, plants could grow upright penetrating sand bar covering them.

There are two kinds of coastal and inland salt marshes in Egypt. As for coastal salt marshes, they are found along coasts of Mediterranean Sea, Red Sea, Gulf of Suez and Gulf of Aqaba in addition to Northern Lakes. Inland salt marshes are located in salty marshes and lands in oases and depressions. About 1775 species of plants were recorded therein as follows (279) in North Sinai, (472) in South Sinai, (328) in North Coast, (66) in Halayeb, (205) in Western Desert and (280) in Eastern Desert. Results of surveys clarified that most of recorded plants are included in the traditional knowledge in Sinai, Northeast, Eastern and Western deserts. Biological diversity is represented by 324 species in El-Omayed protectorate that is considered as an example of deserts' protected areas, including many endangered species particularly large mammals, such as Gazelles. In addition to the presence of some genetic resources such as wild cotton in Siwa.

Dorcas Gazelle (Gazella dorcasdorcas): Egyptian Desert was resided by six species of large mammals known by Antelopes, Mountain Gazelle (*Gazella gazelle*), Scimitar Horned Oryx (*Oryxdammah*), Rhim Gazelle (*Gazella leptoceyos*), and Africa Wild Ass (*Equusasinus*). These animals were prevalent in the deserts till mid-1940th of the last century.As a result of hunting and drought, Mountain Gazelle (*Gazella gazelle*), Scimitar Horned Oryx (Oryx dammah), Rhim Gazelle (*Gazella leptoceyos*), Africa Wild Ass (*Equusasinus)* exclusively disappeared and only Orcas Gazelle (*Gazella dorcasdorcas*) and Rhim Gazelle (*Gazella leptoceyos*) endured and are in jeopardy of extinction. The Orcas Gazelle is moderately widely spread than Rhim Gazelle that had been monitored in limited areas of Western Desert close to Siwa oasis; while Orcas Gazelle subsist in plentiful areas as it was monitored in eleven protected areas (Wadi El-Gemal, Siwa, White Desert, Elba, Wadi El-Rayan, Wadi El-Alaky, El-Asuti, Catharine, Degla, Nabeq and Taba).Studies designated that numbers of Gazelles are habitually decreasing with different rates according to their area of existence and range of threats they are exposed to. Dorcas Gazelle is well thought-out to be one of the indicators of biodiversity conditions in Egyptian environment that is eminent by its sprightly and quick movements to remote distances looking for graze. It feeds on leaves and fruits of El-Sayal trees, grasses and bushes being one of the browsers and not grazers. For that reason, it assisted in the estimation of plants and consequently helping in their growth. Both male and female of Dorcas Gazelle have ring horns but female's horns are smaller and more cylindrical than those of male. Breeding season starts in autumn, giving birth in spring and sometimes early in January. Female mostly deliver only one borne each time and nursery period does not exceed three months. Egyptian Gazelle could live for more than twelve years. Studies conducted on Gazelle evidenced that it existed in all Egyptian deserts and valleys and due to threats; Gazelle had been exposed to many threats during last decades. For that a program to monitor Gazelle was carried out in all protected areas known of its existence to determine its current status. Studies concentrated in protected areas of Wadi El-Rayan, Saint Catherine, Nabq, Wadi El-Gemal, and Elba Mountain.

3. Importance of biodiversity for Egypt

Biodiversity strengthens countless lives and livelihoods with economic returns; it is the basis of food, medicines, industries, tourism, spiritual fortification and recreational activities. Furthermore, it plays a part in amending the natural processes thus maintaining the earth's life support systems (Table 10). Agricultural production, for instances, is reinforced by biodiversity and ecosystem services such as provision services (food, fuel or fiber is the end product), a support services (microorganisms cycling nutrients and soil formation), regulatory services (pollination and pollution control), and cultural services (spiritual or aesthetic benefits). The loss and degradation of biodiversity would therefore have serious social, economic, cultural and ecological implications.

Table 10: Services and goods provided by ecosystems

Ecosystem	Goods provided	Services provided
Agro ecosystems	Food crops Additional food items (e.g. terrace fields, fishery Frankincense, fibre Crop genetic resources crops	Maintain limited watershed functions (infiltration, flowcontrol, partial soil Conservation Provide habitat for birds, pollinators, soil organismsimportant to agricultureBuild soil organic matterBind atmospheric carbon Provide employment
Mountain and Rangeland Ecosystems	Timber Fuel wood Drinking and irrigation Water Fodder Non-timber products Food (honey, mushrooms, fruit, and other edible plants; game Genetic resources	Rénove air polluants, produc oxygen Cycle nitrents Protect water resources (infiltration, purification, flow control, soil stabilization)Maintain biodiversity Bind atmospheric carbonModerate weather extremes and impacts Generate soil Provide employment Contribute aesthetic beauty and provide recreation
FreshwaterEcosystems	Drinking and irrigationWater Fish and other aquatic organisms Hydroelectricity Housing materials Medicines Genetic resources	Lessen or prevent the impact of floodingDilute and carry away wastesCycle nutrients Maintain biodiversity Provide transportation corridor Provide employment Contribute aesthetic beauty and provide recreation
Coastal and MarineEcosystems	Fish and shellfish Sea weeds (for food andindustrial use Salt Genetic resources	Moderate storm impacts (mangroves; barrier islands)Provide wildlife (marine and terrestrial) habitatMaintain biodiversity Dilute and treat wastes Provide harbors and transportation routes Provide employmentContribute aesthetic beauty and provide recreation

The genetic components of some fauna and flora species sustain the development of medicinal, agricultural and industrial products as well as the basic daily needs of local communities.

In addition, biodiversity supports the development of many new services (e.g. ecotourism) which provide high economic return. Loss of biodiversity touches the ability of ecosystems to deliver these and other services. Identifying economic values of biodiversity goods and services is relatively new and is gaining recognition in Egypt.

4. Socio-economic significance of Biodiversity

Natural Capital can be defined as the world's stocks of natural assets including mainly biodiversity. Poorly managed Natural Capital becomes not only an ecological liability, but a social and economic liability too. Working against nature by overexploiting Natural Capital can be catastrophic not just in terms of biodiversity loss, but also catastrophic for humans as ecosystem productivity and resilience decline over time and some regions become more prone to extreme events such as floods and droughts. Ultimately, this makes it more difficult for human communities to sustain themselves, particularly in already stressed ecosystems, potentially leading to starvation, conflict over resource scarcity and displacement of populations.

Recently, several socio-economic and cultural studies were carried out in different Protected Areas representing different ecosystems, results confirmed the revenues linked with biodiversity. Omayed Protected Area (representing desert ecosystem) provided services to agriculture worth of 33 million LE annually, rangelands provided returns equal to 8 million LE annually. Services provided by Brullus Protected Area (representing wetlands) are estimated more than annual L.E. 200 million. Services afforded by marine ecosystems (Red Sea) are worth of hundreds of billion pounds annually. They are so dissimilar, including coral reefs, mangroves, islands, beaches, sea grasses, fishes, reptiles, birds and marine mammals.

A noteworthy portion of Egypt's Gross Domestic Production (GDP) is truthfully related to the use of bio-resources. Total agriculture production accounted for 13.2% of Egypt's GDP (81.3 billion Egyptian pounds) and employed 32% of the total work force (more than 6 million jobs in agriculture and fisheries) in 2012. According to the annual report issued by the General Authority for Development of Fish Resources (GAFRD, 2012), fish production in 2011 over 1.3 million tons with a value of 18 billion Egyptian pounds are captured from marine and inland capture fisheries and brackish and freshwater aquaculture. The natural resources (Nile River, Red Sea, and Mediterranean) provided 375,354 tons (18.5% of total production) of which marine fish production reached 122,303 tons (12.5% from total fish catch). The aquaculture sector produced 986,820 tons (81.5% of total fish production). In addition, fish hatcheries produced more than 270 million fish fries (sea bream, sea bass, soles, shrimps, tilapias and carp) that are used in developing fish production in some lakes and fish culture.

The traditional knowledge of Local communities, mainly tribes of Bedouins in Sinai, Ababda, Bishariah and Rashida in the eastern desert; and Sons of Ali and Barber in the western desert includes all sciences and experiences mystifying in the memory of local communities. The importance of traditional knowledge is providing the new generation with the experience of their old generation in life styles and environment. Therefore, the Egyptian government had given special attention to protect and document all traditional knowledge and their uses. Traditional knowledge of a large numbers of plants had been recorded including those in South Sinai (38 species), North Sinai (45), Halayeb (19), Western Desert (13), and Eastern Desert (16). Information included handicrafts in Elba, Wadi Gemal, St. Catherine, Al-Arish, Mattrouh and Siwa. However, up to date studies had shown decreases in such traditional knowledge as new generations were not tied to them, and were interested in modern civil life style that bring diverse job opportunities (e.g. tourism). A draft law on regulation of bio-resources had been prepared, together with a national strategy of medicinal plants that were based on their implementation on local communities.

It is essential for proper management of an ecosystem, to identify the goods and services provided by such ecosystem. It is also argued that another essential element for such proper management to take place is to determine how to quantify ecosystem services in a way that is meaningful for decision-makers. One such a way involves expressing the value of these goods and services in monetary units that can be easily understood and compared along the board with other aspects related to policy and/or decision making. This monetizing process is called “economic valuation” of ecosystem goods and services.

In 2015 National Biodiversity Strategy and Action Plan project together with Strengthening Protected Areas Financial sustainability project, conducted economic valuation for ecosystem services and goods at Wadi El Ryan and Ras Mohamed protected areas representing two different ecosystems.

It was found that the discounted present value of Wadi El Ryan ecosystems, at 7% and 10% discount rates, to be L.E. 1118.2 and 865.89 million, respectively. Meanwhile, the potential value of Wadi El Rayan Ecosystem is, also, estimated and could generate additional L.E. 211.47 million annually from agricultural activities expansion within the protected area.

On the other hand, the value of Ras Mohamed Protected Area ecosystems is about US$ 271.3 million/year. This value includes fishing activities, bio-prospecting, education and research and recreation functions of the most prominent ecosystems in Ras Mohamed National Park, namely; coral reefs and mangrove(Abdrabo & Hassan, 2015).

In order to sum up the overall economic value of RMPA, the value of the annual flow needs to be discounted to the present, assuming a business-as-usual scenario. For this purpose, a 7% and 10% discount rate over a 25 years period were employed. Accordingly, the present value of Ras Mohamed ecosystem is estimated to be US$ 3665.14 and 2951.35 million under 7% and 10% discount rates, respectively (Abdrabo & Hassan, 2015).

5. Main threats and drivers of change to biodiversity (direct and indirect)

Threats to biodiversity in Egypt are either directly or indirectly linked to human impacts, with the former including extreme hunting, clear-cutting and deforestation, and the latter linked to habitat devastation for developmental purposes and all pollution types, including refuse from industry and human settlements. Disproportionate hunting is endangering several species of resident and migratory birds as well as a number of hoofed animals (e.g. gazelles). Pollutants in the air, water and soil (especially in rural areas) are also threatening a large number of plants and animals as well as leading to an extensive increase in other harmful exotic ones (e.g. species of rats and birds, red spider mites, American cotton worm). A famous example is the detrimental effect of the introduction of the water hyacinth (*Eichhorniacrassipes*) on life in the Nile River. Major threats to marine ecosystems are unregulated tourism, exploitation of marine resources, overfishing and fishing in illegal areas (e.g. breeding grounds) and coastal pollution. At present, 20% of Egyptians live in coastal areas which are also visited annually by 11 million tourists. In addition, more than 40% of industrial activity occurs in the coastal zone. Threats are accentuated by increases in the level of desertification due to climate change as well as in human populations. Many plant and animal species are situated at the limits of their geographical or ecological dissemination ranges. Under such surroundings, these species have limited tolerance for ecological pressures, as is exemplified by corals in the Red Sea, the Gulf of Suez and the Gulf of Aqaba.

Threats to marine ecosystem: Major threats to marine ecosystems are unregulated tourism, exploitation of marine resources, overfishing and fishing in illegal areas (e.g. breeding grounds) and coastal pollution. At present, 20% of Egyptians live in coastal areas that are also visited annually by 11 million tourists. In addition, more than 40% of industrial activity exists in coastal zones. Lack of a sustainable and operative system to address natural heritage management issues is hampering the nation's ability to conserve and manage its unique and critical resources. Lack of sufficient regulation of marine tourism, lack of satisfactory infrastructure to protect the natural resources and insufficient regulation of desert tourism are causing the destruction and degradation of natural habitats, landscapes, cultural heritage sites and other resources. Lack of sufficient coordination and cooperation among all concerned parties in Egypt for data collection, storage and analysis of biodiversity and absence of comprehensive legal protection for natural heritage resources outside the Protected threaten future sustainable return from these resources. All of these are compounded by the fact that few economic incentives are for biodiversity conservation (National Environmental Action Plan (2002-2017).

The percentage of coastal and marine protected areas of total PAs, number of marine species extinct or at risk of extinction as a result of change in the marine and coastal environments and its degradation, and the status of threatened sensitive marine and coastal habitats (e.g. mangroves and coral reefs) could also be used as state and pressure indicators.

Biodiversity is confronting many threats including population growth pressure, hunting removal of wild flora particularly medicinal plants, cut of trees in many important habitats, globalization and its unenthusiastic impacts on extraction of biological resources, limited human and financial resources, habitat worsening due to pollution, agricultural and industrial activities, habitat fragmentation due to large projects. In addition, too many species of plants and animals were introduced into Egypt over the last two centuries; some of them with economic importance such as cotton, fruits, fishes, chickens, and cattle's. This led to many

Egyptian species became so sparse and are about to disappear (agriculture genetic resources). Some species were introduced intentionally (to increase agriculture, animal and fish production) or unintentionally (Suez Canal, bird migration). This led to dispersal of many invasive species that had been affected negatively on the agriculture (pests such as Red Palm Weevil), and aquatic (water hyacinth, freshwater lobster) habitats. Consequently, biodiversity hurts greatly from the introduction of invasive species in Egypt. It might be said that all ecosystems, habitats, and species are no longer in ecological balance, where all habitats of Egypt whether wetlands, inland, agricultural, deserts or even mountains as well as deep habitats in Mediterranean Sea had been impacted by human interventions.

During the tenth COP of Biodiversity Convention hold in Nagoya-Japan, most parties highlighted that the following five major pressures are still affecting global biodiversity around the world represented by habitats mortification; over-exploitation and unsustainable use; climate change; invasive alien species and pollution.

Threats touching costal and marine areas in Egypt are mainly pollution and unsustainable use of marine resources. Degradation of environmental quality and gradual deterioration of its renewable resources might decrease ecosystem services and finally cause their complete loss. This degradation of coastal and marine areas is mainly resulting from development pressures that exceeded their carrying capacity as unsustainable exploitation of marine resources and unplanned rapid economic development for some areas such as urban development along the coast of Suez Canal, and northern coast, deterioration of fish stocks due to overfishing and deterioration of its breeding and nursery areas in many areas, especially in Mediterranean Sea. The deterioration of fish stocks in Red Sea is lower than in Mediterranean Sea due to declaration of some protected areas along coasts and islands of Red Sea. This forced some Egyptian fishing companies to go fishing in international waters of some neighboring countries within Red Sea. Sanitation discharged in Mediterranean Sea and some of its coastal lakes are of the most important sources of coastal pollution in Egypt deterioration of marine and coastal environment in Egypt, are resulting from the social pressures on the government to meet needs of the growing population (unemployment, introduction of new patterns of development, competition for exploiting available resources, lack of public awareness with the importance of inherited culture associated with unorganized development plans and threat of investments due to beaches' erosion).

Threats to wetlands ecosystem: Egypt’s wetlands are subject to a variety of human induced threats that are leading to the degradation of this valuable national resource. Main threat facing Egyptian Northern coastal lakes and their vulnerability to climate change is habitat loss and degradation driven by significant reduction in area as a result of drainage for conversion to other land uses such as agriculture and settlements, abstraction of water for irrigation, coastal erosion, water pollution, over fishing, use of illegal fishing methods, illegal harvesting of fish fry, introduction of alien species, spreading of aquatic plants and the blockage of their connections with the sea. The severity of pollution varies among various lakes and the main causes in all cases are the discharge of untreated or partially treated industrial and household waste water (mainly sewage) and the dumping of agricultural drainage loaded with fertilizer, pesticide and herbicide residues. Eutrophication resulting from enhanced input of plant nutrients mainly nitrogen (N) and phosphorus (P) due to agricultural runoff and discharge of domestic wastewater, as well as occurrence of metal and pesticide contaminants constituted in these lakes problems of increasing concern. The levels of pollution in these lakes are Lake Maryout> Lake Manzala> Lake Edku> Lake Burullus.River systems had also been degraded drastically during the past 50 years. They are being significantly affected by water withdrawals, leaving some small rivers nearly or completely dry, reducing biodiversity. However, the water quality of Nile River and Lake

Nasser is within the international permissible level (State of the Environment Report 2007). Many invasive species are also recorded in the Nile River; most important are water hyacinth and freshwater crayfish. The water hyacinth covers some 487 km^2 of the river and the networks of irrigation and drainage canals throughout the country and 151 km^2 of the lakes, causing 3.5 billion cubic meters water loss annually from evaporation. It also prevents the sunlight penetration causing changes in the ecosystem and species diversity. Freshwater crayfish uncontrolled spreading led to deterioration of local fisheries, crops and irrigation networks.

As early as 1977, prior to the dramatic increase in private fish farming enclosures, lake surface areas lost to land reclamation were already 60% in Maryout, 29% in Edku and 11% in Manzala lakes. By 1988, losses had risen to 30% in Manzala and 62% in Edku. Today, Manzala's surface area is a mere one third of its original expanse of 327,000 feddans and Lake Edku has been reduced to less than half its original size**.** Similarly**,** Lake Burullus had lost an estimated 37% of its open-water area and 85% of its marsh area in the past 40 years, largely as a result of ongoing drainage and land reclamation. The situation is compounded by the fact that the water quality in what remains of these lakes has been seriously compromised through the systematic discharge of waste into them.

Northern Delta lakes are highly eutrophic as a result of the enhanced input of nutrient salts as agricultural fertilizers mainly nitrogen (N) and phosphorus (P). Lakes had become increasingly rich in plant biomass, especially algae, resulting in the depletion of dissolved oxygen and often cause increased species mortality, changes in species assemblages and loss of aquatic flora and fauna diversity (Gamil and El-Karyony, 1994;El-Tantawy, 2012).Pesticides and the relatively higher levels of heavy metals are severely damaging fish habitats, species survival and water quality in wetland areas. According to surveys of fish in the 1980s, over 60% of fish sampled in the four Delta lakes contained DDT and benzene chloride. Numerous other investigations in the four lakes had shown high levels of heavy metals, pesticides and PCBs in fish.

Wetlands in Egypt are facing many threats that lead to their degradation, such as:

- Excessive expansion in scooping costal lakes for implementing development projects. For example El-Burullus Lake had been shrunk from 57 thousand km^2 in 1953 to 42 thousand km2 in 2000, meaning loss of more than 1/3 of its total area.
- Intrude of sewage drainage with agricultural water generated from cities and villages located along costal lakes that increase rate of pollutants in coastal lakes such as El-Burullus, Edko and El-Manzala that affect biota and decrease services and resources of these lakes.
- Sedimentation, alluvium and sand creep are among the natural threats wetlands are exposed to, which threaten to shrink narrow barriers separating each lake from the sea.
- Climate change, mainly sea level rise.
- Overgrazing and erosion of vegetation coverage due to the increased pastoral load to meet increased local consumption, in addition to drought episodes associated with low rainfall and poor management of rangelands.
- Mines spread along large areas of North Coast and Western Desert, left from the II World War in El-Alamein area that contains nearly 17.5 million mines occupies an area of more than quarter million feddans suitable for agriculture.

As a result of wastewater discharge into Lake Maruit since 1988 and excessive fishing pressure, most of the less tolerant high-valued fish such as Mugil cephalus, Labeo niloticus, Bagrus bajad, Latesniloticus and Barbus bynni, decreased or completely disappeared from the lake while Tilapia spp. flourished and it represented about 90 % of the total yield in recent years. The mullet catch in Lake Maryout has been reduced from 3.6% of the catch in the late1970s to less than 1% in the early 1990s. The eel catch is in danger of disappearing completely.

- In Lake Manzala, there had been a substantial reduction over the last few decades in both fish and bird species. In Lake Burullus, the fish composition of the Lake has changed over the years due to the change in the environmental conditions of the lake.
- In Lake Bardawil, fisheries catch composition had been changed since 1995 and the contribution of the most economic species such as the sea bream and sea bass has sharply declined from 56.5 %, in the 1982-1988, to about 7.5 % in 2007, of the total catch.

Threats to mountain habitats: Mountains and wades are characterizing landscape of much of the Eastern Desert and Sinai. Mountain habitats of South Sinai and Eastern Desert, particularly Gebel Elba support exclusive faunal and floral biodiversity. Biodiversity loss in mountain habitats is initiated from certain human activities such as hunting, logging, trafficking, urban development, invasive alien species, climate change and natural disasters (mainly flooding).Climate change phenomenon has been documented in St. Catherine Mountains by monitoring its impact on the desertion of living organisms on peaks of St. Catherine due to temperatures' increase that might expose some organisms to be in danger, such as Sinai baton blue (Pseudophilotes), the smallest butterfly in the world. Its larva feed on buds of Sinai Thyme (*Thymus decussates*), while adult butterflies feed on nectar of its flowers. Studies evidenced that annual change in temperatures; expedite its exposure to danger of extinction. It is viewed that rate of Sinai Thyme flower (*Thymus decussates*) decreased with about 40% or more during drought years, and if temperature degrees continue its increase, Sinai Thyme (*Thymus decussates*) will resume its decrease that would expose Sinai baton blue (Pseudophilote) to danger of extinction within very limited period, especially if exposed to human threats, such as over grazing and collection of Sinai Thyme (*Thymus decussates*) for medical purposes.

Threats to agricultural biodiversity: The main threats to the agricultural biodiversity in Egypt are: 1) urbanization expansion on agricultural land; 2) introduction of high yielding varieties and their wide use that led to the neglect and disappearance of traditional varieties and local breeds and the erosion of crop plant and livestock genetic diversity; 3)

abandonment of traditional agricultural practices caused loss of cultural landscapes associated with biodiversity; 4) invasive species, such as palm weevil, invasive weeds and various agricultural pests that caused significant economic losses; 5) excessive use of agrochemicals had led to the disappearance of important agricultural wildlife (pollinators, kite, owl, fox, mongoose and wild cat) and groundwater contamination; 6) absence of suitable successive agricultural cycles; viii) use of surface flooding irrigation that led to land degradation, reduction of soil fertility and increased soil salinity; increased migration from rural to urban areas with increasing burden on resource, 7) use of surface flooding irrigation methods that led to land degradation, reduction of soil fertility, 8) increase soil salinity, groundwater contamination with pesticides and chemicals, However, the impact of conservation interventions on the extinction risk of these species cannot be assed due to lack of monitoring programs over a certain period of time.

6. Biodiversity-related national commitments and programs

International Cooperation

Egypt has been among pioneer countries interested in biodiversity conservation and the preservation of natural resources and heritage. In 1936, Egypt became party to the Convention Relative to the Preservation of Funa and Flora in their Natural State (London 1933). This was later followed by signing and ratifying conventions and agreements pertaining to the various aspects of biodiversity conservation, such as The Agreement for the Establishment of a General Fisheries Council for the Mediterranean Sea" in February 1952, The Agreement for the Establishment of a Commission for Controlling the Desert Locust in the Near East in 1972, The Africa Convention on the Conservation of Nature and Natural Resources in 1969, The International Convention on the Protection of Cultural and Natural Heritage (Paris, 1972), The Convention on Trading in Endangered Species of Wild Animals (Washington, 1975), The Convention on Conservation of Migratory Animals (Bonn, 1979), and The Convention on Wetlands of International Importance Especially as Waterfowl Habitat (also known as the Ramsar Convention, in 1986). Furthermore, Egypt welcomed the World Conservation Strategy formulated jointly by IUCN, WWF and UNEP in 1980. The National Committee of IUCN in collaboration with ASRT put forward a "Draft National Strategy for the Conservation of Natural Heritage in Egypt". However, implementation of this draft strategy has not been achievable for various political and socio-economic reasons.

In 1992, Egypt signed the Biodiversity Convention. Ratification of this Convention has been completed in 1994. In article 6, this Convention required the parties to formulate national strategies setting framework for the conservation of biodiversity. A national strategy for biodiversity conservation should define the goals, the guiding principles and the national plan of action. The policy-making body entrusted with the task of biodiversity conservation is EEAA. For the national strategy to be comprehensive and appropriate, it should cover species diversity, covering all hierarchical taxonomic levels of plants, animals and micro-organisms, habitat diversity, and genetic diversity in species of plants, animals and micro- organisms.

International conventions

The conservation of judicious ecosystems and biodiversity is mandated through regional and international conventions that call on member states to establish and maintain protected areas. The Arab Republic of Egypt is signatory to some eight international and regional agreements having provisions for protected areas. These conventions obligate Egypt and the member states to establish and maintain a network of protected areas to protect ecosystems,

representative habitats, threatened species, cultural heritage sites and traditional knowledge of value to all mankind. According to the Constitution, international conventions signed by Egypt have the same power as Egyptian law.

Regional Cooperation

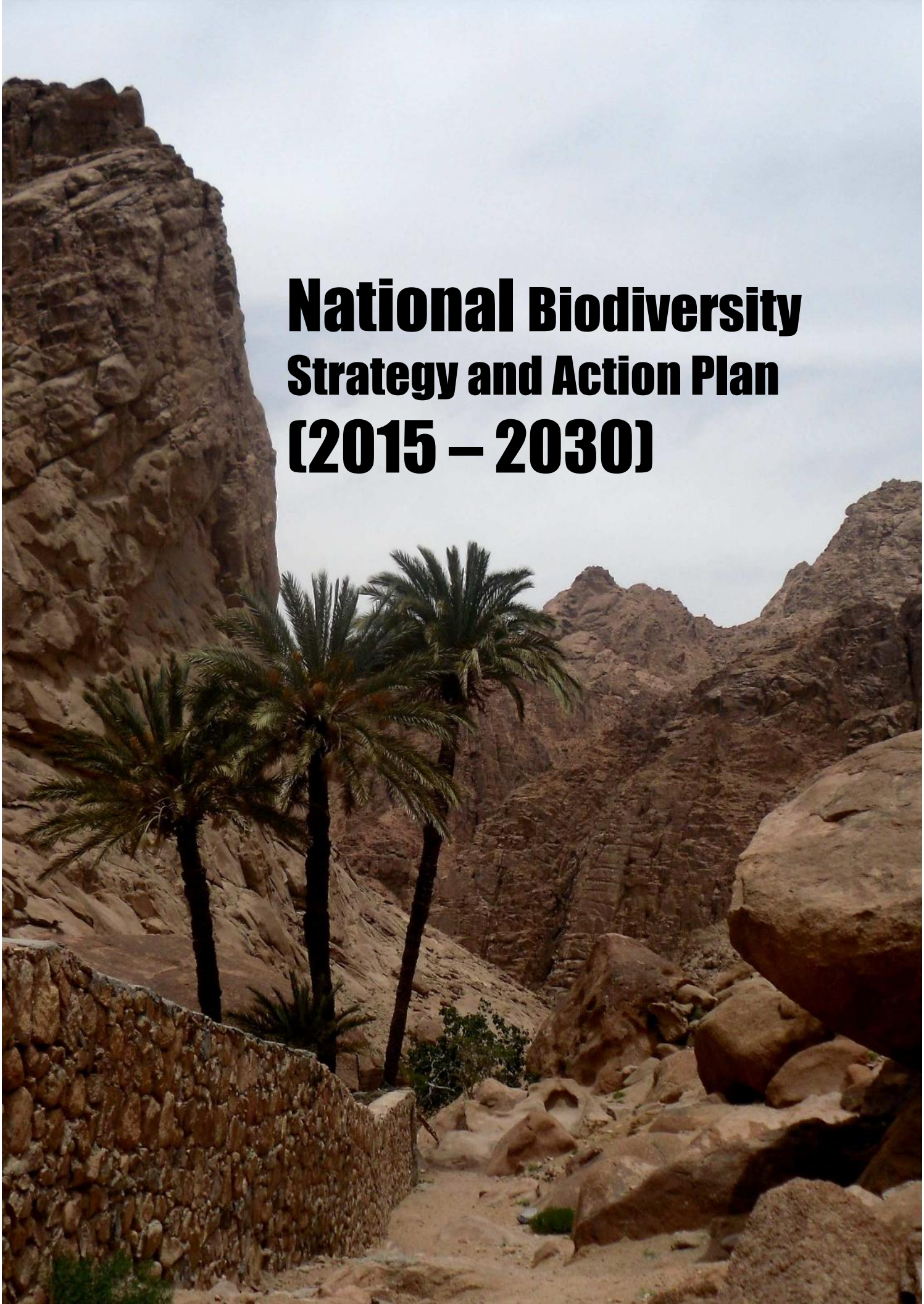
Mediterranean Action Plan: The need for action to protect environment and to care for development in Mediterranean Basin became ubiquitous. In 1975, the Mediterranean countries and the European Economic Community (EEC) adopted the Mediterranean Action Plan (MAP), and in 1976, the Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona Convention), under the auspices of the United Nations Environment Program (UNEP). The main objectives of MAP were to assist Mediterranean Governments to weigh up and control marine pollution, to formulate their environmental policies, to improve skill of Governments to identify better options for alternative patterns of development, and to make coherent choices for allocation of resources.

MAP is synchronized by the Barcelona Convention Secretariat, the Coordinating Unit (MEDU) that had been based in Athens since 1982. Contracting Parties to Barcelona Convention (the Mediterranean States and the European Union) meet every two years on a Ministerial level to deliberate on general policy, strategy and political issues pertinent to their cooperation as well as to decide on MAP's program and budget in the fields of **marine conservation** and **coastal areas management.**

Red Sea and Gulf of Aden Action Plan: The geographic coverage of this plan is seven States (Egypt, Jordan, Palestine, Saudi Arabia, Somalia, Sudan and Egypt). The action plan was adopted in 1982 and the convention was signed in the same year and started to be operative in 1986, yet the plan did not attain real progress due to lack of funds. Two programming sessions were held between the Secretariats of UNEP and of the Program for the Environment of Red Sea and Gulf of Aden (PERSGA) that technically co-ordinates the action plan (Jeddah, 25-26 June 1987; Nairobi, 25-26 April 1989). The following major potential areas of co-operation were acknowledged, ecological surveys aiming at development of conservation strategies; valuation of the levels and effects of oil pollution; and intensification the pollution research and monitoring capabilities of the region. The areas identified for co-operation fall within the overall program adopted by the meeting of the Interim Council of PERSGA (Aqaba, September 1988). Under an agreement between UNEP and IOC, and in cooperation with PERSGA, the IOC will organize the finalization and follow-up of the project proposals on strengthening marine pollution monitoring capabilities in four countries (Egypt, Jordan, Sudan and Egypt) within the framework of the Red Sea and Gulf of Aden Action Plan, and will provide preparatory assistance to national institutions selected as participants in these projects. These projects will aim at establishing a marine pollution-monitoring network in that part of the region and at strengthening the associated national institutions.

Bilateral Cooperation

During the past decade, Egypt received a total amount of about £E 950 million for environmentally related projects from the donor community. GOE allocated about £E 63 million for these initiatives. The donor funds billed for technical and institutional support of MSEA and EEAA were £E 114 million, about 12 percent of the total funds the donors provided to Egypt in the sphere of protecting the environment. MSEA and EEAA received another £E 68 million, about seven percent of the total funds, to meet their mandate in protecting nature. The remaining £E 768 million were allocated for projects that MSEA and EEAA jointly put into practice with other agencies.



National Biodiversity Strategy and Action Plan (2015 – 2030)

The road map for the preparation of the (2015-2030) strategy went through several steps begin with the formation of the national biodiversity committee; revision of the first strategy (1997-2017); consultative process for priorities and threats to biodiversity in Egypt; creating the frame work for the current strategy; forming of the six working groups to cover all the strategic goals; Drafting the strategy; revision by global NBSAP forum; stake holders and biodiversity specialist consultation for issuing the final version.

The biodiversity indicators are essential in developing and implementing the national biodiversity strategy and action plan were lack of indicators on national levels can pose serious challenges especially in consistency of biodiversity data, as well as availability and accuracy of information for decision making.

The Biodiversity Indicators Partnership developed a global biodiversity indicators that can be used at national level. The Developed indicators were 33 of these 20 are aggregated from national level data and 13 use global level data that can be disaggregated for use at national level. Therefore the presented indicators for the strategy are preliminary and will be further developed after COP13 to match the latest suggested ones.

IV. National Biodiversity Strategy and Action Plan (2015 – 2030)

1. Guiding Principles Goals

Guiding Principles: The NBSAP adopts a framework that places Egyptians and nature at the center of the government anxiety in the development process. Its components had been based on the following sustainable development principles:

A. Equity

- Ensuring social consistency and harmony through unbiased distribution of resources and providing various sectors of society with equal right of entry to development opportunities and benefits today and in the future**.** No individual or social groups should be denied the prospect to benefit from natural resources. The equal rights and opportunities of men and women must be assured.

B. Solidarity and shared responsibility

- Recognizing that sustainable development is a communal, collective and inseparable responsibility that calls for institutional structures based on the spirit of solidarity, convergence and collaboration between and among various stakeholders.
- Recognizing that since communities residing within or most neighboring to a given ecosystem would be the ones to most precisely feels the positive and negative impacts of human activities on that ecosystem, they should be enabled access to and control over common natural resources, such as water and biodiversity.
- Protection of natural resources is viewed as a joint and indivisible responsibility of all individuals, families, communities, and other institutions in society.
- Biodiversity conservation and enhancement are pursued through direct commitment of local communities and indigenous peoples and the extension of corroborate to institutional initiatives including harmonization of national and local biodiversity-related policies, legislation and programs.

C. Ecological Soundness

- Recognizing nature as our common heritage and thus respecting the restricted carrying capacity and integrity of nature in the development process to ensure the right of present and future generations to this heritage.
- The uprightness and carrying capacity of biological resources should not be degraded, but rather conserved, protected and enhanced in the process of development.
- Egypt own rich biotic resources many of which are now threatened and some already extinct. The future development of the country must be a sign of the intrinsic value of its landscapes, terraces, ecosystems, habitats, populations, species and genes.

D. Know-how and eco-technology

- The biological limits to natural resource productivity are scientifically researched and recognized and had become the bases and indicators for strategic policy decisions on societal use of the country's natural resources
- Habitual review, proposals for proper amendment of the strategy, and precise enforcement of environmental laws are undertaken by both communities and appropriate government institutions.

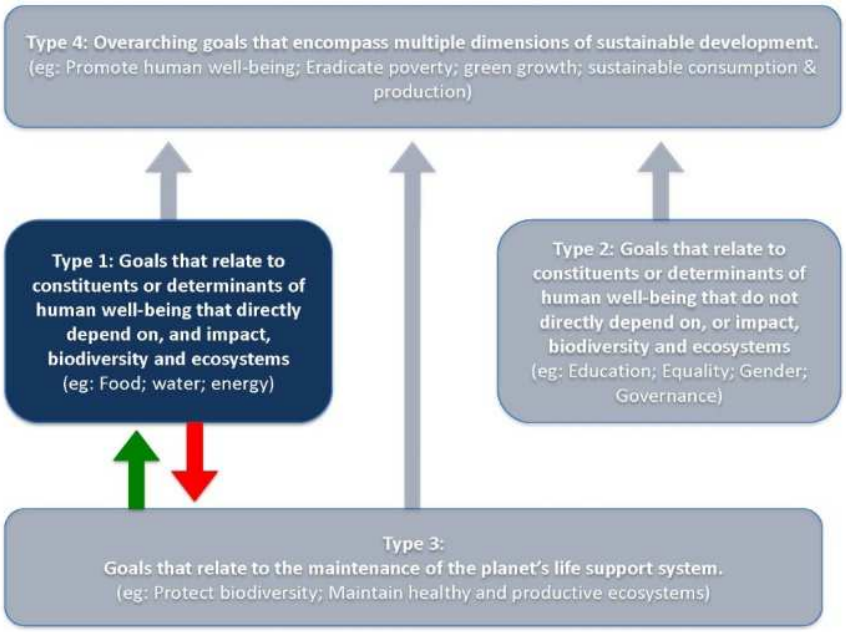
E. Spiritual Values

Spiritual commands us to look up to other plants, animals and creatures living with us and to consider them living communities, exactly like mankind. God created earth and all creatures living on it in due proportion and measure. So protection, conservation and development of the environment and natural resources is an obligatory Spiritual duty to which everyone should be dedicated any deliberate or intentional damage to the natural environment and resources is a kind of mischief or corruption that is forbidden. The Spiritual actions calls all individuals at all levels to protect, conserve and use environment and natural resources sustainably.

F. Sustainable use of natural resources.

- Protecting the biodiversity resources against dangers of deterioration or loss through establishing and improving natural protected areas' networks, conducting research, and adopting essential monitoring and evaluation measures.
- Ensuring the sustainable management and use of natural protected areas and promoting conservation of biological diversity.
- Preserving the natural values and reducing adverse environmental impacts on natural protected areas.
- Ensuring that each protectorate is managed appropriately to optimize income generation without prejudicing the natural values for which it has been protected. This income is to be used in improving and developing other parks.
- Promoting the conservation and sustainable use of wild resources outside national protected areas in consultation and, where practicable, in collaboration with rural communities and user groups.

Goals: The goal of a national strategy for conservation of biodiversity is to set the basis of the rational use and sustainable development of the national natural resources so that **t**hey remain fit for use and capable of production in ways that provide for the rightful necessities of the present and for the basic needs of future generations as shown in the figure.


Type 4: Overarching goals that encompass multiple dimensions of sustainable development.
(eg: Promote human well-being; Eradicate poverty; green growth; sustainable consumption & production)
Type 1: Goals that relate to constituents or determinants of human well-being that directly depend on, and impact, biodiversity and ecosystems
(eg: Food; water; energy)
Type 2: Goals that relate to constituents or determinants of human well-being that do not directly depend on, or impact, biodiversity and ecosystems
(eg: Education; Equality; Gender; Governance)
Type 3:
Goals that relate to the maintenance of the planet's life support system.
(eg: Protect biodiversity; Maintain healthy and productive ecosystems)

Source: CBD 2002

This will oblige harmonization and maximum harmonization between conservation measures and national plans for development in the various sectors of the economy (agriculture, industry, tourism, housing, etc.).

Natural resources comprise ecosystems that produce human needs (farmlands, pasturelands, fisheries and woodlands) and the biotic (plants, animals and micro-organisms) and the abiotic elements (soil, water and air) of these ecosystems, non-renewable (stored) resources (geological formations of minerals, coal, oil, natural gas, fossil groundwater) and energy elements within the biosphere (solar, wind, waves and tides and geothermal). This strategy aims at conserving these natural resources and guarding against their destruction or over-exploitation so as their production be sustained at present and in the future.

The strategy also aims at setting in clear terms that margins the social dependability of the present generation. Sustainable development requires justice in sharing the resources and maintenance of social peace and setting ethical responsibility towards future generation, our children and grandchildren, as sustainable development and conservation of natural resources foresee long term time horizons into the future.

This might be achieved through the following six goals:

1. Conserve and manage terrestrial and aquatic biodiversity to ensure sustainable use and equitable benefits to the people.
2. Sustainable use of natural resources.
3. Access to genetic resources and Benefit sharing (Nagoya protocol).
4. Improve our understanding of biological diversity and ecosystem functioning in a changing environment.

5. Prepare for climate change and combat desertification.
6. Build partnerships and integrate biodiversity into all national development frameworks.

The achievements of these goals necessities the implementation of dissimilar activities and projects covering varied areas.

2. General Considerations

- To guarantee the best use of biodiversity elements, those with known economic utility and those that we do not yet know their use but future inquiries might discover their uses.
- To argue ecological balances in the productive ecosystems so as to avoid viscous circles of ecological imbalance, e.g., incidence of new pests, deterioration of productivity, etc. Maintenance of ecological balance in pristine ecosystems is particularly necessary in nature reserves.
- To shelter elements of biodiversity resources against dangers of deterioration or loss. These elements might provide future generations with valuable resources. These elements have their inherent right to survive and it is our human responsibility to observe this right.
- To care for elements of biodiversity as parts of our cultural heritage. The Pharaonic heritage is rich with murals and depictions of plants and animals, and Arabic literature (poetry) is burdened with references to names and attributes of plants and animals. The loss of papyrus and sacred ibis is a cultural loss for Egypt.
- These issues and concerns are, and should be, reflected in rules and mechanisms set for regulating use of biodiversity resources, that is, hunting and culling, grazing, cutting wood and collecting medicinal plants, etc. Egypt is also worried with a number of important issues related to biodiversity conservation, sustainable development and the rational use of natural resources. These include:
- The issue of bio-engineered organisms and its economic, ethical and legal aspects; this is the issue of bio-safety. The Deputy Prime Minister and Minister of Agriculture established by decree no. 85 of 1995 a National Committee for Biosafety under his chairmanship. The Committee negotiated and endorsed a: Biosafety Regulations and Guidelines for Egypt.
- The problems associated to parasites and pathogens borne by wild and domestic animals, particularly transient and migratory birds, which could infect humans; this might require the furtherance of the quarantine functions.
- The multifaceted issues related to protection of indigenous knowledge and intellectual property; the Biodiversity Convention provided for these rights among countries parties to the Convention (the right to share equitably the benefits of developing and utilizing indigenous biodiversity materials), but this principle does not commit countries that are not signatories and hence countries, like Egypt, should enact a national law which ensures the protection of national property rights as regards native biodiversity resources.

3. Vision and Mission

Vision:

Biodiversity is a natural asset that fortifies sustainable development. Egypt future depends on sustainable management of its natural, physical, and human assets. Egypt most serious challenges represented in poverty eradication, food security, provision of fresh water, soil conservation, and human health all depend directly on maintaining and using biological diversity.

Therefore "By *2030 biodiversity in Egypt is valued, mainstreamed, maintained for the good livelihoods and conserved for the sustainable use of future generations*".

This vision is generated through participatory approach of stakeholder'sengagement on various levels within national dialogue.This levels include ministerial, government officials, academia, educations,cooperative associations, Non-Governmental Associations (NGOs) and end users.

In order to define the road map for updating the strategy a national committee for biodiversity was declared by prim minster decree in 2013. Upon declaration the committee formed 6 thematic groups to cover the various issues concerned with the biodiversity strategy. The committee adopted a stockholder'sengagement plan with a wide consultative approach.

Mission:

"*Egypt takes effective and innovative actions to reduce the loss of biodiversity to ensure that by 2030 ecosystems continue to provide their services to all Egyptian and also ensure pressures on biodiversity are reduced; biological resources are sustainably used and benefits arising out of utilization of genetic resources are shared in a fair and equitable manner; biodiversity issues and values mainstreamed and appropriate policies are effectively implemented in a participatory approach.*"

4. National Action Plan

Certainly Egyptian natural resources are the core of the national economy, the depletion or deterioration of these resources represents not only a loss of the country's national capital but undermines the sustainability of its economy. In the NBSAP process a number of environmental issues of national concern were recognized and analyzed in order to determine their priority weight and inclusion in the action plan. This section describes priority actions for implementing the strategy, and presents the tactic used for the selection of priorities. Given the large number of issues enclosed by the strategy, considering the country restricted resources, it was obligatory to prepare a set of criteria for prioritizing actions and projects contributing to the implementation of the contemporary strategy. These criteria are geographicimpact, consistency with convention objectives, urgency, sequence, country-driven, attainable and resource able and multispectral implications. These primary criteria might be discussed as follows:

Geographic Impact: Actions with potentially comprehensive geographic impactare more imperative than actions of localized impact.

Consistency with Convention Objectives: Action that directly affects biological diversity is deemed less pertinent than action that directly affects it.

Urgency: The action is pressing when it addresses highly deteriorated ecosystems, and where a large number of people or resources are under immediate threats or risk.

Sequence: Actions/projects are prearranged in time-sequence when one action/project's output is input or precondition to a second one. According to this criterion, programs addressing data, policy and legislation gaps are located before implementation programs and forest protection programs are before forest production programs and so on.

Country-driven: Projects that keep up the inclusive country interest and lie within government's priorities are more viable than projects that are of pure global nature. Such projects are politically supported by the government and have many opportunities to be funded from national sources, including government, NGOs, private sector and local communities.

Multispectral Implications: A specific involvement is given special priority when it seeks to address issues of interrelated impacts on biodiversity, climate, freshwater and desertification. Terrace rehabilitation, protected areas establishment and eco-practices in agriculture are examples of such actions.

Attainable and Resource able: Projects with clearly defined objectives and sufficiently funded activities backed-up with cross-sectorial, shared and inclusive management mechanism are certainly to be more successful in producing their planned outputs in an efficient and effective manner.

Priority actions:

It is planned to give priorities on the following components:

- Strategic Goal 1: Conserve and manage terrestrial and aquatic biodiversity to ensure sustainable use and equitable benefits to the people
- Strategic Goal 2: Sustainable use of natural resources:
- Strategic Goal 3: Access to genetic resources and Benefit sharing (Nagoya protocol, indigenous knowledge and traditions)
- Strategic Goal 4: Improve our understanding of biological diversity and ecosystem functioning in a changing environment:
- Strategic Goal 5: Prepare for climate change and combat desertification:
- Strategic Goal 6: Build partnerships and integrate biodiversity into all national development frameworks.

FUNDING NBSAP

Defective funding is major obstruction affecting national biodiversity conservation and might harshly influence the attainment of settled on targets. Regrettably conservation spending baseline data is not easy to assemble and incomplete in many countries. Egypt is no exception. It is therefore critical that activities are undertaken to calculate the relative sufficiency of the levels of Egypt's conservation finance. It is also imperative that such baseline judgment adequately carry out a disparity analysis of the level of underfunding in biodiversity conservation. Leveraging on ensuring the diversification of sources of funding as a strategy is very important. This should make certain that domestic expenditure is aided by donor spending, private philanthropy and conservation trust funds. Finally innovative forms of financing should also be explored to guarantee that appropriate economic instruments and financing mechanisms are acknowledged and used. The exploitation of such economic instruments and financial mechanisms should be motivated by their expediency in implementation as well as their congruency with the broader economic, political and social and equity dynamics of Egypt.

5. Matrix of Strategic Goals, National Targets, Themes, Priority Actions and Indicators

STRATEGIC GOAL ONE: Conserve and manage terrestrial and aquatic biodiversity to ensure sustainable use and equitable benefits to the people.

FIRST THEME: PROTECTED AREAS

BASELINE	CHALLENGES
• 30 declared protected areas. • Existing protected areas coverage is 150,000 km^2. • 25% of sharks are endangered • Five species of turtles (out of seven) are endangered. • 14 PAs have management plans (8 of them are out of date). • 12 PAs passed through management effectiveness evaluation (all are out of date) • 3 PAs have business plans • Average annual income is LE 20 Million/year. • 4 international Ramsar sites • 34 international important areas (IBAs) • One World Heritage Site (WHS) • Two biosphere reserves	• Weak operational, administration and management system for protected areas; • lack of proper updated PA management plans • Insufficient staff and financial resources. • Unsatisfactory law enforcement mechanisms for PAs. • Weak use of GIS in planning process • Lack of accurate information system on the number of fauna and flora species in Egypt • Limited Institutional Capacities for protected area • Absent proper criteria for defining critical habitats • lack of international cooperation to support PAs • Lack of regular monitoring of PAs • Limited environmental awareness, and lack of knowledge of current activities • Perceived conflict of interest between protected areas and local communities • Illegal hunting and use of natural resources within PAs

NATIONAL TARGET 1: By 2030, PAs network secured and expanded to cover 17% of total terrestrial and inland water and at least 5% of coastal and marine representative areas, especially priority sites of particular importance for biodiversity and key ecological processes, and Effective management of PAs.**(Aichi target 11)**

PRIORITY ACTIONS:

- Establish a new self-financed for conservation of biodiversity based on the current initiative by the Sustainable Finance of Protected Areas Project.
- Establish coherent network of PAs with especial attention to marine PAs.
- Set new programmes for the capacity building of staff members.

- Set up GIS-based national planning and evaluation system in accordance with the international standards.
- Define and implement proper criteria for proper management of key biodiversity hotspots.
- Establish standardized national monitoring systems within PAs based on the current monitoring efforts.
- Increase close cooperation with international organizations at both technical and financial levels
- Develop and implement CEPA strategy for PAs in accordance with the Global CEPA for NBSAPs.
- Develop five years action plans that include required staff, equipment and infrastructure based on the actual financial gaps
- Implement green economy instruments in PAs.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)[1]
• PAs coverage • Number of declared international sites • Annual allocated budget for PAs secure • Annual generated income from PAs	**MoE**	**2030**	**75**

SECOND THEME: ENDEMIC AND ENDANGERED SPECIES

BASELINE	CHALLENGES
• Limited data on endemic species distribution and abundance. • No official national Red List of species adopted by both Egyptian Scientific Inistitutions and IUCN. • Several national lists (butterflies – mammals – reptiles – birds – plants). • Primary, globally important and sensitive species communities have not been identified • Update the limited information on important areas for biodiversity outside protected plant, bird & marine areas	• Current status of most species is out of date. • Limited data to evaluate the species against the Red List criteria. • Quotas have not been established for economically important plant and animal species. • Habitats host endangered species are under continued stress. • Overexploitation of resources. • Weak law enforcement of wildlife protection measures outside PAs.

NATIONAL TARGET 2: By 2020, develop and implement unified Egyptian methodology for the identification and monitoring of priority of all components of biodiversity according to the international standards to ensure the maintenance or rehabilitation of 50% of our most threatened species focusing on mammals and reptiles to a favorable conservation status.**(Aichi targets 5,6, 12)**

PRIORITY ACTIONS:

- Develop national interactive centralized biodiversity information system.
- Assess status of species and habitats.
- Ensure the conservation of 20% of threatened species and reintroduce critically endangered species as appropriate and feasible.
- Ensure conservation and management of biodiversity hot spots located outside protected areas.
- Promote more*ex-situ* conservation efforts.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• No (%) of inputs within the biodiversity information system. • Number (%) of known threatened species communities assessed and documented. • No(%) of implemented recovery programs for critically endangered species.	**MoE - RI**	**2020**	**5**

[1] The proposed budgets developed based on: (1) previous figures described in the previous NBSAP; (2) financial analysis of NCS developed by the NCSCB Project; (3) business plans of Wadi El-Gimal, Wadi El-Rayan and Ras Mohammed; (4) studies developed by the FSPA Project; (5) amount of international aids to conserve biodiversity within the last 20 years; (6) inflation rates and trends defined by the Egptian Central Bank within the last 20 years.

THIRD THEME: *EX SITU* CONSERVATION	
BASELINE	**CHALLENGES**
• Complementary *ex-situ* conservation measures for 17 animal and plant species (e.g. Arabian Oryx, Dorcas Gazelle, turtles, Acacia, etc.) • The exact baseline numbers for the above species are available in the 5th NR.	• There are 5 private captive breeding centres for threatened native animal species. • Limited mechanisms for re-introduction of captive/breeding animals into wild inside PAs. • No guidelines for establishment and operation of captive breeding centres. • Scarce data available about the produced generations in captivity
NATIONAL TARGET 3: By 2030, National conservation and rehabilitation programmes of threatened and endemic species at risk are developed and implemented with measures to evaluate its implementation.**(Aichi targets5,6,7,12)**	
PRIORITY ACTIONS:	
• Practice and adopt a national policy on *ex-situ* conservation. • Inspire *ex situ* conservation through the establishment of natural history museum, gene banks, seed banks captive breeding centers, zoos and public gardens. • Develop guidelines and mechanism for collection, maintenance, reproduction and reintroduction of plants and animal species in ex-situ programmes	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• No/ (%) of species that re-introduced into PAs annually. • No/ (%) of *ex situ* mechanisms implemented. • No/ (%) of gene banks, seed banks, green belts and public gardens established.	**MoE – MALR - RI**	**2030**	**12**

"Egypt has no National Natural History Museum. The NHM is the central bank of biodiversity and the most important reference in taxonomic studies. It is the place where the type material must be deposited and where specialists of different taxa of plants and animals work to study and to identify the components of biodiversity in the country. The Egyptian NHM is necessary to complete the studies of both the fauna and flora of Egypt. It is also necessary for both North Africa and the Middle East that are void of national NHMs. Its services may cover not only Egypt, but also the whole region."

FOURTH THEME: ALIEN INVASIVE SPECIES (AIS)	
BASELINE	**CHALLENGES**
• 137 alien plant species: causals (50 species), neutralizers (50 species), weeds (31 species), invaders (5 species) and transformer (1 species) (Ref. 5th NR) • 211invasive species: aquatic plants (44 ssp.), terrestrial plants (40 ssp.), crustaceans (16 ssp.), insects (26 ssp.), spiders (1 ssp.), fish (29 ssp.), mammals (3 ssp.), birds (5 ssp.), reptiles (1 ssp.), amphibians (1 ssp.), viruses (17 ssp.), fungi (8 ssp.), bacteria (6 ssp.), nematodes (5 ssp.), mollusks (5 ssp.), echinoderms (1 ssp.), coelenterates (1 ssp.) and polychaetes (2 ssp.) (Ref. 5th NR) • No established programmes and weak implementation of AIS.	• Insufficient information about number, trends and extent of invasive species in Egypt. • Limited information about the impacts of AIS on ecosystems, economy and human health. • Poor well-defined figures about human, financial and technical resources needed for combating AIS. • Weak institutional capacities in evaluating and preserving alien species. • Lack of national monitoring system for alien invasive species. • Shortage of adequate legislative tools to control introductions of alien invasive species. • Lack of preventive and remediation measures.
NATIONAL TARGET 4: By 2030, all IAS and pathways are identified and prioritized with measures in place to update and verify these pathways, with national programmes for 30% of identified pathways to control and manage IAS.**(Aichi targets9)**	
PRIORITY ACTIONS:	
• Update and verify a list of alien invasive species and identify the most dangerous ones.	

- Monitor and control the expansion of key AIS with relevant authorities.
- Reinforce quarantine measures to control intentional and unintentional introduction of AIS.
- Launch and strengthen database of alien species
- Institute a specialized unit to be concerned with AIS.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• No. and percentage of published AIS records. • No. and percentage of national implemented programs for management of AIS annually.	**MoE – MALR - RI**	**2030**	**7**

STRATEGIC GOAL TWO: Sustainable use of natural resources.

FIRST THEME: AGROBIODIVERSITY & FISHERIES

BASELINE	CHALLENGES
• Currently total agriculture production exceeded one million ton annually and accounted for 13.2% of Egypt's GDP (81.3 billion Egyptian pounds) and employed 32% of the total work force (more than 6 million jobs in agriculture and fisheries) (Ref. 5th NR). • Over 1.3 million tons, having a value of EGP 18 billion, were produced from marine and inland capture fisheries and brackish and freshwater aquacultures. • The total area of clean farming estimated roughly at 170,000 hectares (70 farms – 160 companies).	• Little attention is paid to the conservation of agrobiodiversity at the national level. • Lacking of information on Egypt's agrobiodiversity, its current status, associated products and traditions. • Import/export of genetic materials is not legislatively controlled. • Access to genetic materials is limited for both farmers and research programmes. • Economic incentives for the conservation of Egyptian agrobiodiversity are lacking. • Gaps exist in current legislation relating to agriculture and fishing. • The recovery of certain economically important fish species will require specific restoration efforts. • Specific mechanisms for fish stock restoration and protection have not been put in place.

NATIONAL TARGET 5: By 2020, Conservation of natural resources through the adoption of ecologically sustainable agricultural management practices.**(Aichi targets6,7)**

PRIORITY ACTIONS:

- Develop a national agrobiodiversity conservation program with relevant authorities in association with public organizations.
- Improve capacity for the recovery and preservation of agrobiodiversity.
- To create an agrobiodiversity and fisheries inventory.
- To conduct research and conservation relating to the wild relatives of native domestic species and varieties.
- Strengthen the capacity of relevant governmental agencies through (among other mechanisms) provision of specialized training.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Number and (%) of national program of agrobiodiversity conservation officially approved. • Number and (%) of domestic plants and animals reported in the national Red list. • Number and (%) of action plans for endangered domestic species and varieties created. • Number and (%) and areas of organic farms annually. • Number and (%) of local domestic plants cultivated annually. • Number and (%) of fully equipped hatcheries using modern fish breeding techniques established.	**MALR – MoE – RI**	**2020**	**15**

SECOND THEME: TOURISM	
BASELINE	**CHALLENGES**
• Ecotourism in Egypt contributed to more than LE 96.8 billion (5.6% of total GDP) in 2013. • Tourism directly supported 1,251,000 jobs (5.1% of total employment) in Egypt in 2013. • 14.7 million Tourists in 2010. • 2.5 million Tourists visited PAs. • Tourism is estimated to have accounted for 20.5% of GDP in 2011, and it is a key that links Egyptian economic development with poverty alleviation and biodiversity conservation (as described in the 5th NR).	• Unsatisfactory regulation of ecotourism. • Low level of environmental awareness and ecological education. • Generalized deficiency in eco-tourism facilities. • Inadequate legislative framework and weak enforcement of eco-tourism legislation. • Fragile local communities and private sector participation in tourism management and investment in this sector.
NATIONAL TARGET 6: By 2018, apply CBD tools to monitor and control the impact of tourism on biodiversity, in particular in protected areas and vulnerable ecosystems. **(Aichi targets 3,4)**	
PRIORITY ACTIONS:	
• Sustainable management of ecosystems, its heritage and cultural resources based on best conservation and tourism models for the socio-economic wellbeing of the communities and other stakeholders. • Promote environmentally sound, sustainable tourism through "wise use", ecotourism practices and technologies, in particular at South Sinai, Red Sea, and Western Desert. • Promote marine conservations and ecotourism in the business community and general public. • Promote desert safari to be ecologically reliable avoiding destruction and degradation of natural habitats, landscapes, cultural heritage sites and other resources. • Carry out surveys of areas suitable for eco-tourism, taking into account habitat vulnerability. • Support criteria for eco-tourism development in protected areas and buffer zones. • Reduce the impact of tourism activities on biodiversity and natural habitats. • Assess impacts of recreational activities in coastal areas. • Encourage eco-tourism in established and managed national parks. • Launch projects to establish infrastructure and management programs for marine tourism at key sites to mitigate negative environmental impacts • Set up guidelines and licensing procedures for the desert tourism industry. • Develop environmental education and awareness campaigns to generate awareness about desert conservation, ecotourism and encourage support for management program	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Number and (%) of survey published reports on assessment of impacts of eco-tourism on biodiversity components especially coral reefs. • Number and (%) of hotels and companies applied criteria for eco-tourism. • Number and (%) of pilot tourism projects implemented in protected areas annually. • Number and (%) of sites published in the national a directory for eco-tourism and in accordance with EU Sharter for Eco-tourism within PAs.	**MoE – MoT**	**2018**	**5**

THIRD THEME: POLLUTION	
BASELINE	**CHALLENGES**
• Levels of pollutants concentration in the Nile River, northern lakes, inland water and marine ecosystems, are given in the 5th NR on 2014 (e.g. fertilizers, nutrients, pesticides, heavy metals, etc.) • Through large scale irrigation (particularly in North-Eastern Regions), pollution is damming and over-	• Weak enforcement of laws related to pollution.

abstraction of groundwater (as described in the 5th NR).	

NATIONAL TARGET 7: By 2020, measures, including waste management plans and law enforcement, are in place to prevent and reduce the impact of pollution and waste on ecosystems, especially on wetlands and coastal and marine areas.**(Aichi targets8,10)**

PRIORITY ACTIONS:

- Set up periodical national assessment of pollution within different ecosystems taking into account habitat vulnerability.
- Establish criteria for monitoring of pollution inside protected areas and associated buffer zones.
- Set Capacity building for research and development regarding combating pollution.
- Undertake measures to minimize the impacts from local pollution instances such as oil spills, harmful algal blooms and hydrogen sulphide events at the coast
- Update greenhouse gas inventory and take action to reduce Greenhouse Gas emissions.
- Develop and implement Environmental Management Plans (EMPs) for all urban areas.
- Develop and implement National Implementation Plans (NIPs) for the Stockholm and Basel Conventions.
- Promote increased adoption of the "reduce, re-use and recycle" principle by residents, as well as the public and private sector. Bill on waste management and pollution control enacted and implemented.
- Investigate and install alternative systems to make use of solid waste as an economic resource.
- Develop, monitor and enforce minimum national standards on soil, water and air quality as well as occupational health.
- Enhance the infrastructure and natural resource base of all protected areas to make them attractive destinations for tourists and tourism investors and to improve the working environment.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Number and (%) of published reports on assessment of pollution. • Number and (%) of issued decrees to enforce pollution control. • Number and (%) of rehabilitated or restored pilot projects in polluted ecosystems. • Number of waste disposal sites upgraded • Volumes of waste recycled annually • Trends in water quality in aquatic ecosystems (dams, rivers and Ramsar Sites) • Presence / absence of key indicator pollution species.	**MoE – MoI – RI - MALR**	**2020**	**15**

FOURTH THEME: LAND USE PLANNING

BASELINE	CHALLENGES
• Existing land use planning practices neglect the concept of health ecosystems and their thresholds.	• Damage of natural habitats as a result of desertification and land conversion. • Destruction of sensitive natural habitats caused by unplanned land reclamation. • Rapidly growing population with intensive use and pressure on natural resources particularly in the densely populated centres of the country.

NATIONAL TARGET 8: By 2025, negative effects of different sectoral policies (land-use planning, transport, energy, uncontrolled urbanization, etc.) on priority elements of biodiversity are minimized, and measures to correct these effects are applied through developing and implementing land use plans.**(Aichi target 3)**

PRIORITY ACTIONS:

- Uphold environmentally friendly land use practices.
- Enhance the implementation of land regulation, pricing and registration.
- Minimize the uncontrolled urbanization and enhance land-zoning and land use management plans.
- Develop mapping of soil degradation and desertification
- Expand desertification control programs focusing on conservation of plant cover, reduction of soil erosion and watershed management.

• Develop guidelines for strategic EIA for projects.			
INDICATORS	**RESPONSIBILITY**	**DEADLINE**	**Proposed budget (USD Millions)**
• Number (%) of land-zones and land use management plans implemented. • Number (%) of SIA developed and approved and implemented • Number (%) of restoration and desertification control project carried out. • Number (%) of maps developed for sustainable land use planning.	**MoE – MoP – NLUPC – MoT - MALR**	**2025**	**10**

FIFTH THEME: INLAND WATERS	
BASELINE	**CHALLENGES**
• Species diversity in Nile includes: 87 aquatic weeds, 100 zooplankton and 80 phytoplankton species (algae), 58 species of fish, 31 amphibian species and reptiles, and more than 200,000 bird species were recorded. • Status of species diversity in inland water and northern lakes is well reported in the 5th NR as a baseline.	• Discharge of untreated or partially treated industrial and household waste water. • Discharge of agricultural drainage loaded with fertilizer, pesticide and herbicide residues. • Many invasive species are recorded in the Nile River.
NATIONAL TARGET 9: By 2021 rate of wetland loss reduced by 25% and water efficiency in irrigation improved by 50%.**(Aichi targets 6,8,10)**	
PRIORITY ACTIONS:	
• Continue wetland restoration and desertification control programs.	

INDICATORS	**RESPONSIBILITY**	**DEADLINE**	**Proposed budget (USD Millions)**
• Number (%) of Ramsar sites are improved and effectively managed	**MoE – MoI – MALR**	**2025**	**25**

SIXTH THEME: SUSTAINABLE USE OF COASTAL /MARINE LIFE	
BASELINE	**CHALLENGES**
• Status of species diversity in marine ecosystems is well reported in the 5th NR as a baseline.	• Over-exploitation, pollution and mismanagement of fishing in the Red Sea and Mediterranean Sea and Egyptian Islands. • Over-fishing and lack of quality controls. • Damage of coral reefs and underwater habitats caused by bottom trawling, ornamental fishing • Weak conservation and sustainable use of marine and fishery resources.
NATIONAL TARGET 10: By 2027, promote the implementation of good fishing practices in both Mediterranean Sea and Red Sea, favorable to fish protection and their habitats.**(Aichi target 6)**	
PRIORITY ACTIONS:	
• Develop habitat mapping, and sensitivity analysis of the entire coastline. • Develop data base management systems of fishery resources based on stock assessment. • Prepare and implement pilot Integrated Coastal Zone Management Plans • Conserve key threatened coastal, coral relief, mangrove and marine species, habitats and ecosystems. • Re-plant/re-forest mangroves wherever feasible.	

INDICATORS	**RESPONSIBILITY**	**DEADLINE**	**Proposed budget (USD Millions)**
• Number and % of assessments, reports and maps on	**MoE – RI**	**2027**	**15**

coastline habitats and endangered species. • Number and % of reports about fishery resources. • Number and % of pilot ICZM Plans implemented. • Number and % of fishery management plans officially approved. • Number and % of pilot area of forest mangroves re-planted.			

STRATEGIC GOAL THREE: Access to genetic resources and benefit sharing (Cartagena and Nagoya protocols).

FIRST THEME: ACCESS TO GENETIC RESOURCES AND SHARING OF BENEFITS

BASELINE	CHALLENGES
• No. national legislation and mechanisms for controlling the transfer and use of GMOs. • No national legislation for ABS. • There is a national strategy for researches related to biotechnology developed by the Ministry of Sceietific Researches. • Number of plant genetic resources recorded and preserved in the national gene bank as reported in the 5th NR. • There are some activities related to biosafety legal frameworks implemented by the Biosaefty Project.	• No legislation to control the national, or international movement of GMOs and give the rights to public to monitor these GMOs • There is little information on the short or long term impacts (ecological, social or economic) of GMOs • There is little information concerning alternative options to the use of GMOs • There is little capacity to assess the risks of biotechnology use • There is poor understanding of how to prevent the accidental release of GMOs in to the environment, and low capacity of how to respond in this situation • Lack of participation of local communities.

NATIONAL TARGET 11: By 2020, Effective operational biosafety and ABS mechanism (measures and legislation) in place, in accordance with national laws and relevant international obligations and serving as national priorities relating to biodiversity.**(Aichi targets 13,16)**

PRIORITY ACTIONS:

- Systematic update of existing biotechnologies applications and uses.
- Building the capacity of NCS as the entity responsible for the management and control of biosafety issues.
- Build up National Biosafety Database and operational BCH based on the requirements of the CBD.
- Normalize, manage or control the risks associated with the use and release of LMOs.
- Develop operational guidelines for issues related to biosafety within PAs.
- Institute "polluter pays" legislation to recover rehabilitation costs of damaged resources affected by applications of GMOs.
- Establishment of a national gene bank for all Egyptian species (economic and wild species).
- Establishment of national framework for trading Egyptian's native genetic resources and for pharmaceutical and biotechnological uses.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Number and % of national biotechnology policy and biosafety frameworks approved and enforced. • Laws on LMOs and Biotechnology prepared and enacted. • Number and % NCS staff trained on biosafety and ABS issues. • Number and % permits reported in the BCH. • Number and % laboratories capable of detecting content of GMOs • Number of ABS agreements implemented.	**MALR – MoE – RI**	**2025**	**5**

Synthetic biology is about writing and programming new DNA with two main goals: create genetic machines from scratch and gain new insights about how life works. Whereas many genetically modified materials (GMO) today contain a single engineered gene, synthetic biology makes it easier to generate larger clusters of genes and gene parts. These synthetic clusters can then be engineered

by more conventional methods into plants or microbes. This could deliver more-nutritious crops that thrive with less water, land, and energy, and fewer chemical inputs, in more variable climates and on lands that otherwise would not support intensive farming. To some, it is a frightening future that has synthesized DNA coming to the farm, market, and dinner table thus further studies and risk analysis are required.

SECOND THEME: SUSTAINABLE USE OF TERRESTRIAL WILDLIFE RESOURCES (FAUNA AND FLORA)	
BASELINE	**CHALLENGES**
• Egyptian baseline for wildlife trade & CMS global database in 2014. • Illegal wildlife trade regulations developed by the Mininstry of Agriculture and Land Reclamation (MALR) are not enforced.	• Weak Institutional structures and financial resources to ensure the sustainable use of natural wildlife. • Current levels of illegal hunting and trade of wild species. • Current application of hunting and harvesting practices do not take into consideration principles of biodiversity conservation. • Hunting and harvesting on monetary value rather than their conservation status. • Smuggling and uncontrolled exporting of wildlife (funa and flora) and threaten medicinal plants species.
NATIONAL TARGET 12: By 2020, to promote sustainable hunting and harvesting through adequate planning, restoration and protection of key biological resources.**(Aichi targets 5,12)**	
PRIORITY ACTIONS:	
• Coserve and management of wild species under the pressures of illegal hunting. • Develop effective tools for combating illegal hunting of wild animals (e.g. illegal birds hunting). • Improve the licensing procedure for hunting of migratory birds. • Define hunting quotas for migratory birds and conduct studies on hunting. • Understand and implelment the concept of sustainable legal hunting.	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Hunting quotas and list of sites officially approved • Gaps in maps and information pertaining to endangered ecosystems, habitats, vegetation and rare species identified.	**MoE – RI - MALR**	**2020**	**7**

STRATEGIC GOAL FOUR: Combating the impacts of climate change and desertification

FIRST THEME: ADDRESSING DESERTIFICATION	
BASELINE	**CHALLENGES**
• Mainstreaming of the status of desertification and synergies with climate and biodiversity conservation as given in the 5th NR.	• Degradation of irrigated farmland as a result of using low quality water in irrigation. • Degradation of rain-fed farmland (northern coastal belt and northern Sinai rainfall. • Degradation of rangeland (northern coastal belt) through overgrazing, degradation of plant cover. • Encroachment of sand formations, especially from the Western desert, on the Nile Valley land (southern Egypt).
NATIONAL TARGET 13: By 2030, Research and implement measures and strategies to strengthen local-level biodiversity resilience to desertification.**(Aichi targets 15)**	
PRIORITY ACTIONS:	
• Establishment of number of remediation of deteriorated areas. • Ameliorating the farming system in desertified regions.	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget

			(USD Millions)
• Levels of soil fertility. • Number of activities combating the deterioration in agricultural ecosystems.	**MoE – RI**	**2030**	**35**

SECOND THEME: CLIMATE RELATED BIODIVERSITY ADAPTATION AND MITIGATION	
BASELINE	**CHALLENGES**
• Impacts and status of climate change **as** reported in the 5th NR.	• Poor mechnisms to predict the impacts of climate change. • National policies and measures responding to climate change. • National assessment needs including financial assistance, technical and technology transfer, monitoring systems, education, and public awareness.
NATIONAL TARGET 14: By 2025, investigate and monitor all the effects of climate change on biodiversity and ecosystem services.**(Aichi targets15)**	
PRIORITY ACTIONS:	
• Assess the impact of climate change on biodiversity in vulnerable areas and protected areas. • Conduct a feasibility assessment of the application of international mechanisms, suggested by UNFCCC (e.g. international carbon market), in Egypt. • Implement Climate Change Capacity Building Phase II. • Continue the implementation of Integrated Solar Thermal / Natural Gas Power Plant (e.g. Kuraymat). • Continue the implementation of the Energy Efficiency Improvement and Greenhouse (GHG) Reduction Projects. • Promotion of wind energy for electricity generation.	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Number of green energy initiatives annually.	**MoE – RI**	**2025**	**15**

STRATEGIC GOAL FIVE: Improve understanding of biological diversity and ecosystem functioning in our environment.

FIRST THEME: TRADITIONAL KNOWLEDGE AND INTERDISCIPLINARY RESEARCH	
BASELINE	**CHALLENGES**
• Numbers and status of species and habitats reported in the 5th NR. • Results about biodiversity in Egypt in UNEP in 2014.	• Poor integrated methods of biodiversity research & monitoring. • Integrated information exchange between responsible agencies is weak.
NATIONAL TARGET 15: By 2020, the knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared, transferred, and applied.**(Aichi targets 2,18,19)**	
PRIORITY ACTIONS:	
• Strengthen the role of the Environmental Ministry in the field of biodiversity research & monitoring. • Improve & maintain a regularly up-dated biodiversity data base. • Provide oriented systematic reports for the general public about the status of biodiversity • Designate an entity (centre) responsible for biodiversity data analysis and for the development of recommendations from monitoring within the NCS.	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• No. of list of key biodiversity declared and managed.	**MoE – RI**	**2020**	**10**

SECOND THEME: PUBLIC AWARENESS, EDUCATION AND TRAINING

BASELINE	CHALLENGES
• Impacts and status of CEPA reported in the 5th NR as given in medicinal plants strategy.	• Public awareness of biodiversity issues is limited, and precise levels of knowledge have been poorly assessed. • Informal environmental education is unsystematic and fragmented. • Knowledge of biodiversity issues among local communities is not officially registered. • Weak cooperation among related sectors.

NATIONAL TARGET 16: By 2020, enhancing environmental awareness of Egyptians of the importance of biodiversity and ecosystem services through integrating environmental themes into university and school curricula, promoting green media, and supporting youth clubs and eco-industry.**(Aichi targets 1,2)**

PRIORITY ACTIONS:

- Develop national guidelines (topics and sources of information, teaching methodologies, a list of typical errors/misconceptions concerning biodiversity issues in the natural and social science textbooks) for teaching of biodiversity and prepare recommendations for the National Teaching Plan.
- Dissemination of biodiversity information in rural areas.
- Increase the national capacity for ensuring the production and use of high quality textbooks; prepare education materials suitable for use at preschool institutions and schools.
- Support the establishment and functioning of eco-clubs in schools to promote teaching of biodiversity-related topics.
- Increase the role of the media in ecological education and strengthen conservation information dissemination.
- Encourage the development of local NGOs focusing on conservation and environmental education.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Number of brochures, leaflets, CD, workshops, printed materials etc. and film produced annually.	**MoE – RI**	**2020**	**12**

THIRD THEME: VALUATION OF ECOSYSTEM GOODS AND SERVICES

BASELINE	CHALLENGES
• Status of valuation of ecosystem goods and services reported in the 5th NR.	• Lack of practical national guidelines for valuation of ecosystem services. • Lack of systematic predictive models (*ad hoc* efforts). • Effect of climate change on goods and services provided by ecosystem. • Lack of common understanding of cumulative impacts on ecosystem services. • Lack of capacity or human resources to conduct valuation of ecosystem services.

NATIONAL TARGET 17: By2018, biodiversity values are promoted and integrated into national planning process and mechanisms to support their incorporation into national accounting and reporting systems to be developed.**(Aichi targets 1, 2,17)**

PRIORITY ACTIONS:

- Conduct an economic valuation of the country's biodiversity and ecosystems services according to the international standards.
- Develop an integral value of biodiversity and its links with livelihoods and key ecosystem services to human well-being and human development
- Develop the right tools and mechanism to incorporate the value of biodiversity and ecosystem services into the national plans
- Formulate an indicative economic plan for biodiversity conservation, based on international experience,
- Create sustainable economic mechanisms for the conservation of biodiversity.

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)

• No. of ecosystem services valued annually. • No. of trained staff on the mechanism and method of valuing the ecosystem services.	**MoE**	**2018**	**3**

FOURTH THEME: LEGAL AND INSTITUTIONAL FRAMEWORK	
BASELINE	**CHALLENGES**
• Law 102 /1983 for protected areas. • Law 4/1994 amended by law 9/2009 for protection of environment. • No. law for wildlife or biodiversity outside PAs. • NCS agency is not declared until now. • Revision of existing legislations to satisfy national needs.	• Weak legislation on wildlife protection outside PAs • The legal basis for ABS and biosafety is limited. • Weak law enforcement of the existing laws 102/1983 and 9/2009. • No clear legislation for land tenure between different stakeholders.
NATIONAL TARGET 18: By 2018, ensure that the national strategy is supported by effective legislation and institutional frameworks to improve its enforcement.**(Aichi targets 2,17)**	
PRIORITY ACTIONS:	
• Legal framework for the establishment of the Nature Conservation Agency. • Set legal mechanisms for economic incentives for sustainable use of biodiversity. • Develop law for conservation of biodiversity. • Adopt and implement legislation regulating biosafety & ABS issues and provide all necessary institutional support for its implementation.	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Issue the presidential decree for the establishment of the Nature Conservation Agency. • No. of regulations issued for sustainable economic incentives. • Issue the law for wildlife protection. • Issue the law for ABS. • Issue the law for biosafety. • Implementation of scientific decrees.	**MoE**	**2018**	**1**

STRATEGIC GOAL SIX: Build partnership and integrate biodiversity into all national development frameworks.

FIRST THEME: NBSAP IMPLEMENTATION	
BASELINE	**CHALLENGES**
• Results reported in the stock taking study and incorporated in the 5th NR will be the baseline for this theme.	• Poor sustainable financial mechanisms for the NBSAP implementation. • Weak mechanism for mainstreaming of biodiversity into the national development planning. • No periodic assessment, evaluation and update of the NBSAP.
NATIONAL TARGET 19: By 2017, proper NBSAP and associated resource mobilization are in place, in addition to establishment of the national biodiversity committee to ensure periodic evaluation of NBSAP.**(Aichi target 20)**	
PRIORITY ACTIONS:	
• Establish National Biodiversity Committee (NBC) in order to conduct periodic assessments, evaluation and update of the NBSAP. • Enhance the implementation of guidelines and scenarios for mainstreaming of biodiversity into the national development plans. • Upgrade the national system for biodiversity indicators to be more effective.	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Number of achieved actions adopted in the NBSAP. • Expended budget form other stakeholders and donors	**MoE**	**2016**	**0.5**

regarding the NBSAP implementation • Number of reports on biodiversity indicators. • No. of fully ma Number of in streamed sectors regarding to conservation biodiversity. • Number of reports and decrees issued by the National Biodiversity Committee (NBC).			

SECOND THEME: FINANCING THE IMPLEMENTATION OF THE NBSAP	
BASELINE	**CHALLENGES**
•	• Poor financial mechanisms to support conservation of biodiversity • Establishment of economic value for biological diversity components • Weak information database on financing of biodiversity conservation • The real values of biodiversity (and possible costs of damage to the resource base) are not taken into account in determining taxes on natural resource use, resulting in unsustainable use of natural resources and under-valuation.
NATIONAL TARGET 20: By 2020, Adequate financial resources for the effective implementation of the Strategic Plan for Biodiversity 2011-2020 has been mobilized of from all sources, and increased substantially from the current levels.**(Aichi targets 20)**	
PRIORITY ACTIONS:	
• Develop resource mobilization strategy and mechanisms for the NBSAP implementation. • Create additional financial mechanisms to promote biodiversity conservation and protected areas (after creation of the new NCA). • Formulate an indicative economic plan for biodiversity conservation, based on international experience. • Reflection of coast of biodiversity conservation on national budget.	

INDICATORS	RESPONSIBILITY	DEADLINE	Proposed budget (USD Millions)
• Budget allocated from different sources for implementation of the NBSAP	**MoE**	**2017**	**0.5**

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